Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

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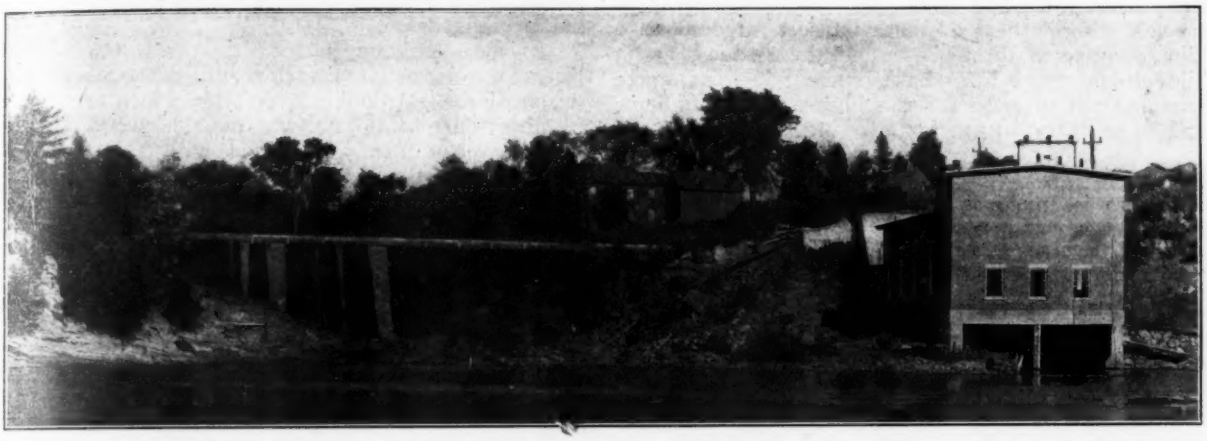


Huntington Falls Hydroelectric Station for Supplying Vermont Marble Quarries. Concrete Dam Gives 40-Foot Operating Head.

Uses of Electricity in Marble Quarries Prove Highly Advantageous

Hydroelectric Power Employed on Generous Scale in the Extensive Electrified Quarries and Mills of the Vermont Marble Company—Advantages of Electric Drive

AN extensive and highly interesting use of electric power, nearly all of it developed in water-power plants, is to be found in the well equipped quarries and mills of the Vermont Marble Company, at Proctor and West Rutland, Vt. In this vicinity there is a dependable water supply insured by the storage reservoirs of the Rutland Railway, Light & Power Company, which are back of the falls at Proctor and an operating head of 120 feet is available.

GENERATING STATIONS.

One hydroelectric plant at Proctor is equipped with three 750-kilowatt, 480-volt, three-phase, 60-cycle alternators, each direct-driven by a water wheel. There is a second station at Huntington Falls, with an operating head of 40 feet with two 2300-volt generators of 750-kilowatt capacity and with belt-drive exciters. There is a third hydroelectric power plant at Beldens, which is practically a duplicate of the Huntington Falls station, having the same generating capacity and operating under the same hydraulic head. Then four miles further upstream from the Proctor plant is a fourth generating station at Center Rutland, where a 275-kilowatt, 460-volt generator replaced an old direct water-wheel drive with a head of 30 feet. The aggregate capacity of these four hydroelectric stations is 5525 kilowatts.

All these hydroelectric plants are located on Otter Creek, a small stream which rises in Bennington County, Vt., flows through Rutland and Addison Counties, and enters Lake Champlain near Vergennes. For many years prior to the adoption of electric drive it supplied the power requirements of some of the mills by means of simple water-wheel drives. Now all of the power for the operation of the quarries and related mills is electric.

Besides these four hydraulic plants there are two steam generating stations with a capacity of 1250 kilowatts which are held in reserve and placed in service during low-water periods. Finally there is also an ample emergency supply available through the interconnection of the transmission system of the Vermont Marble Company and that of the Rutland Railway, Light & Power Company.

The water supply can be relied on during a large part of the year and the hydroelectric stations ordinarily carry the entire load, 16,600,600 kilowatt-hours being supplied by water-power stations and less than 1,000,000 kilowatt-hours was required of the steam plants during the past year.

TRANSMISSION SYSTEM.

There are three transmission voltages used on the different sections of the system, which aggregates

more than 70 miles in length. This includes 56 miles of 44,000-volt line and 10 miles at 11,000 volts, all single-circuit; there is also a considerable length of 2300-volt line. Wooden poles are used on all lines, with spans varying from 150 to 300 feet, excepting at railway crossings, where they are replaced by steel towers. The pole lines are not equipped with a ground wire, but protection is afforded by ten sets of alumium-cell lightning arresters.

There are eleven substations with both single-phase and three-phase oil-cooled and water-cooled transformers totaling over 5000 kilovolt-amperes in service. The largest of these units is rated to 1250 kilovolt-amperes three-phase and the smallest at 33 kilovolt-amperes single-phase, while potentials range from 44,000 to 2300 for the high-voltage windings, and from 11,000 to 230 for low-voltage windings.

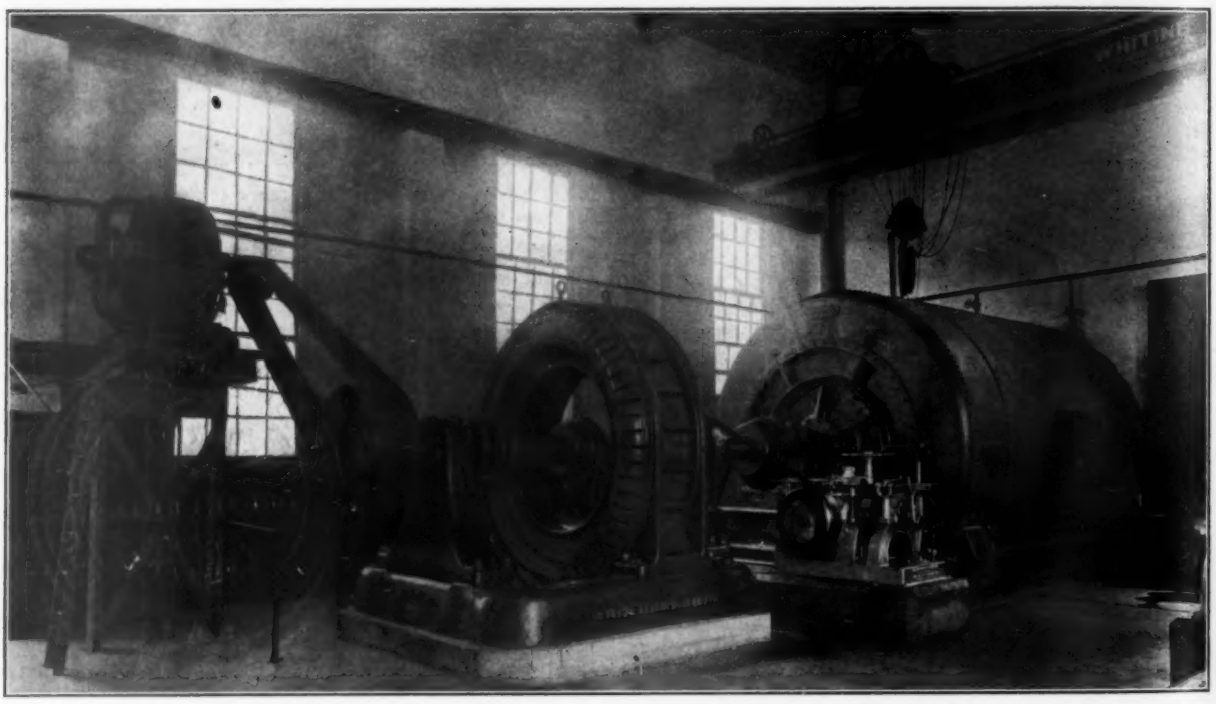
Channelers and Other Quarrying Equipment.

There is employed in these quarries a group of double-lever channelers having a gang of long chisels set on either side of a strong framework and actuated through gearing by a 12-horsepower General Electric railway-type direct-current motor. The vertical reciprocating motion of the chisel gangs, combined with the slow forward movement of the machines, forms narrow channels or slots of the desired length and depth, usually at right angles to the "rift" or natural cleavage line of the marble strata. Cross channels are then cut or holes drilled at right angles to the main channels in order to secure blocks of the desired size.

The driving motors that are mounted directly on the channelers, must be unavoidably and continuously subjected to a considerable amount of vibration when the channelers are in action; but in spite of these severe conditions the original outfits of 20 years ago are today regularly applied on flat cutting and are operating with unimpaired efficiency after an active service of nearly two decades.

On account of diverse arrangement encountered in marble strata, it is frequently necessary to operate channelers at various angles to the horizontal and, as the mechanical design of the standard machines limits their effective use to surfaces which are practically level, another form of machine is utilized where both flat and slope channeling is required. It is equipped with only one chisel gang, which is given a positive reciprocating motion by means of compressed air. This in turn is supplied in a closed circuit by a motor-driven compressor, the entire outfit comprising a self-contained and adaptable-speed unit. The operator can secure all necessary speed adjustments through the motor controller.

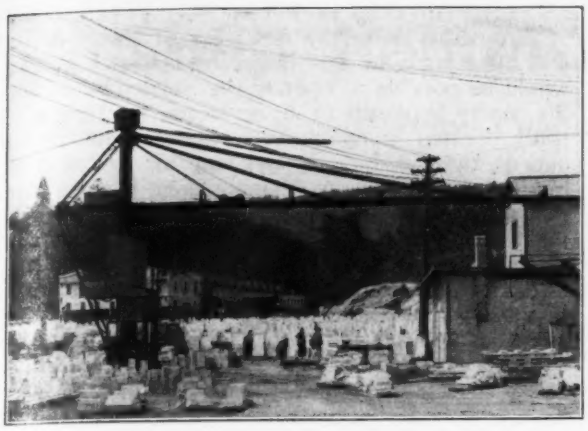
In the Vermont quarries there are used in all about 100 electric channelers, including about two dozen of the old double-lever type, which are driven by direct-current motors, whereas the electric-air machines are uniformly equipped with 12-horsepower General Electric induction motors. These motors have phase-wound rotors and external resistance connected through slip rings, and are specially adapted for conditions requiring frequent starting under load with a relatively low starting current.



One of the 750-Kilowatt Water-Wheel-Driven Alternators and Its Exciter at Huntington Falls Plant.

In addition to the channeling process, the bottom of the block of marble is perforated by means of drills, the holes being usually driven either along, or parallel to, the "rift" or natural cleavage line, thereby rendering it possible to loosen the block by means of levers or wedges. No blasting is required as the actual work of quarrying marble is performed entirely by machinery. There are 70 electric-air drills for this work and operate on the same principle as the electric-air channelers, but the drill proper and the motor-driven air compressor are separate portable units connected only by flexible air tubing. The load conditions are not severe and the compressor is direct-geared to a two-speed 5.5-horsepower induction motor.

While most of the quarries are open workings from which the detached blocks of marble can be re-

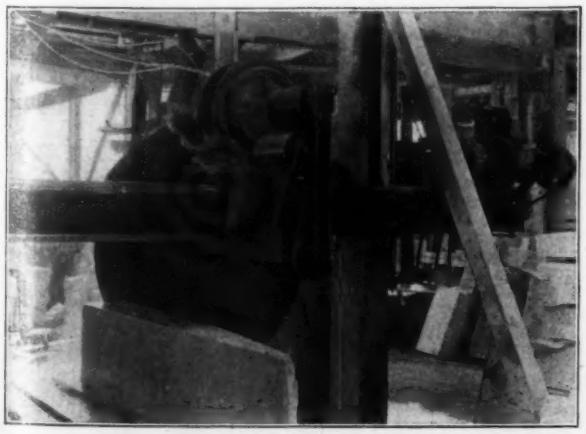


Triple-Motor Swinging Crane Used in Handling Finished Marble for Storage or Shipment.

moved with the aid of derrick hoist, some of them extend for a considerable distance underground, have heavy pillar supports for the roof or hanging walls, and in some respects entail work similar to that encountered in mining. At the West Rutland quarry, in which the workings have been carried to a depth of about 300 feet, the opening at that level exceeds 2000 feet in length. In this quarry electric lighting is required, and an electric haulage locomotive is used to haul the blocks of marble from the underground working face to the base of a slope hoist, which in turn elevates them to the surface. The locomotive is operated on 230 volts direct current, supplied through a motor-generator set to a guarded feeder wire running along one side of the track about 18 inches from the ground. In spite of the limited radius of action of this small tractor, it has proved to be a valuable addition to the quarry equipment.

Ventilation, Lighting and Pumping.

The natural ventilation and lighting of the quarries produces favorable working conditions, but at West Rutland the underground galleries extend a considerable distance from the open shaft, and an artificial circulation of air is therefore necessary. This is amply provided for by a six-foot upcast fan located on the surface and belt-driven by a 40-horsepower induction motor. For illumination 250-watt Mazda lamps are used at all points where the daylight is inadequate.

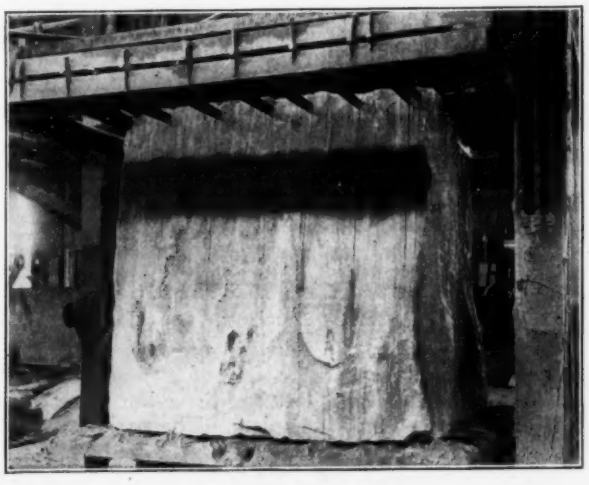


Diamond Circular Saw Driven by 25-Horsepower Motor. Three-Horsepower Motor Operates Feed.

On account of the nature of the work it is evident that underground water in varying volumes may frequently be encountered in quarrying, and as the quarry shafts are practically unprotected, a certain amount of surface drainage and seepage must also be provided for. The pumping sets used for unwatering the quarries include both reciprocating and centrifugal types, driven by induction motors. Small portable pumps driven by two-horsepower motors are available for temporary use, and the stationary units do not in any case require more than 35 horsepower, as the operating head in no instance exceeds 350 feet and the load is not heavy as a rule.

Electric Derricks, Hoists and Cranes.

While a few slope hoists are used in handling the quarried marble, a large percentage of the blocks are brought to the surface by means of simple derrick hoists. At these electrically operated quarries there are in all about 80 derricks and the hoisting motors are rated at from 25 to 165 horsepower with smaller motors usually about 6 horsepower for swinging the



Large Block of Marble Being Cut Into Slabs of Different Thickness by Motor-Driven Gang Saw.

derrick. Steel derrick masts with steel girder booms are largely used. More than 20,000 blocks averaging about 20 tons in weight are handled annually, the largest blocks weighing about 55 tons.

The maximum derrick lift at present does not exceed 325 feet. In some cases a slip-ring induction motor is direct-geared to the main hoist and on the wall is a control board supporting a switch, circuit-breakers and contactors through which the motor resistance is controlled. The resistance units and the motor controllers are located on the floor near the control board. From the nature of the work at the quarries the derrick operation must ordinarily be intermittent, as the average service for the entire battery of derricks is less than one 20-ton block hoisted per day. Many of the derricks are utilized with greater frequency while in other cases they are idle for considerable periods. Equipped with electric drive they are at all times available for instant use and consume power only while in use.

In these quarries when the blocks have been hoisted to the surface they are deposited on flat cars and hauled either directly to the mills or to storage yards where they are piled for future use. The blocks are removed from the flat cars by means of electrically operated cranes and transferred to the mills. General

Electric direct-current motors are used for the storage-yard cranes, which are in some cases equipped with five motors, viz., one bridge motor of 35 horsepower, two hoist motors each 30 horsepower, and two trolley motors each 7½ horsepower. The crane has a bridge span of 160 feet and a capacity of 50 tons. Its load conditions are not exceptional and it does not differ materially from the cranes used for the other block piles, or in other industries; it is referred to merely as a connecting link between the quarry and the mill.

Sawing the Marble.

When the blocks of marble are transferred to the mill for sawing they are delivered to the gang saws or "gangs" by a specially designed trolley-type locomotive crane which travels on tracks running lengthwise through the mill building between two rows of gangs. The overhead yard crane removes the blocks from the flat cars in the yard and deposits them on a short heavy car, which is in turn placed on the tracks of the small transfer car, which is then moved into the mill by the crane and the car carrying the blocks is finally run off onto the sawing beds. This crane is equipped with travel, hoist and turning motor and has also a motor-operated winch for pulling the block-carrying cars onto the transfer car after the sawing operation is completed.

The sawing is electrically done, the saws being toothless and made of soft iron one-eighth inch thick and four inches wide when new. Small pumps are provided to deliver a mixture of sand and water to the saw cuts and the rigid framework containing the saws is given a horizontal reciprocating motion, the sand doing the cutting. There are more than 300 of these electrically operated gangs in service.

In some instances a six-foot circular saw is employed in cutting and trimming marble slabs. It is provided with two motors, one of 25 horsepower for rotating the saw and another three-horsepower unit driving the feeding mechanism. The periphery of the saw has inset diamond cutting tools and very rapid sawing is possible, but it is not intended to perform the work ordinarily done by the gang saws or rubbing beds.

There is also an electric carborundum machine in use for cutting grooves in pieces of marble. The bedplate has a slow reciprocating travel similar to that of a planer, and the adjustable grinding elements are carborundum wheels of various sizes and shapes. As with the saws, it is independently driven, a 20-horsepower induction motor driving both tools and bedplate.

Rubbing Beds and Other Electrically Driven Machinery.

Fully 65 electrically operated rubbing beds are at work in the different shops. The older of these installations consist of groups of five or six machines driven through countershafting by 50-horsepower motors. The individual drive system with its inherent economy is now largely used for this purpose. In the more recent additions to the shop machinery it is usual to provide a 25-horsepower motor, belt-connected to each pair of rubbing beds. The squirrel-cage type of induction motor was adopted for this work and for practically all finishing shop drives.

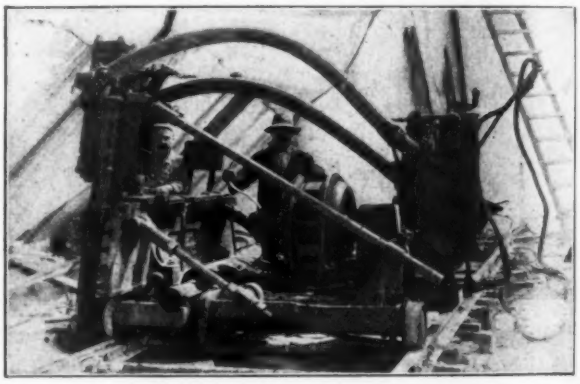
There are several hundred pneumatic hand tools used in the shops and the air is supplied to them at from 50 to 60-pound pressure by motor-driven air compressors. Overhead electric traveling cranes of the usual types are found in both shops and yards.

Marked Advantages Found in Electric Drive.

From the above the flexibility of motor drive is well illustrated in this large installation. While it would be possible to operate the isolated machines in the quarry by means of air or steam, fed from a centrally located compressor or boiler plant at each quarry, the difficulty of installing air or steam pipe lines in the quarry, maintaining them in good condition to avoid pressure losses, and extending or relaying them to take care of the shifting of channelers and drills involved in progressive work, would entail installation and maintenance costs greatly in excess of those of the electric system.

It has been clearly proven that the efficiency of the electric system is unaffected by temperature changes, which must always be considered with steam or air lines, and the laying of additional wire or cable to supply current to new machinery or to meet changes of location of any existing machine can be safely, easily and rapidly accomplished without interfering in any way with the operation of the remainder of the quarry equipment.

It is found that with individual motor drive the energy consumption of each machine is limited to its period of actual operation and the generating equipment need only be designed for the average maximum demand of the entire system. With steam or air, however, the boilers or compressors at each quarry would have to maintain full pressure throughout the working day, even at periods of low loads on the machinery or during changing or adjusting tools on individual machines.



Electric-Air Channeler Driven by 12-Horsepower Induction Motor.

The conditions in a quarry are not by any means ideal for the operation of motors, due to the difficulty of completely protecting them from moisture, dust, mechanical injury, or vibration strains. However, the Vermont marble quarries show that enforced stoppage of work due to motor troubles, even of individual units, is exceedingly rare, and that the repair expense for well designed open-type modern motors, in constant use over long periods, is confined largely to the occasional rewinding of the smaller pump and drill motors. For the larger units it is practically negligible.

In this quarry system there are now in service a total of about 570 motors, ranging in capacity from 2 horsepower to 250 horsepower with an aggregate rating of approximately 14,000 horsepower. Direct-current units are in many cases applied to hoists, cranes and locomotives, and constitute about 25 per cent of the total motor equipment. The remainder are polyphase induction motors operating at 220, 440 or 2300 volts on three-phase 60-cycle circuits.

Is Interest Return an Index of Safety

Reasons Why Public Utility Bonds Yield Higher Interest With Equal or Better Security

By ALBERT H. BICKMORE

A. H. Bickmore & Company.

ONE of the stock phrases of those not thoroughly informed on financial subjects is that interest return indicates degree of safety: in other words that a high rate of interest accompanies insecurity of principal, and that a low interest return indicates safety. It is scarcely possible to make a more misleading statement. As a matter of fact, safety plays a rather unimportant part in determining interest return. This fact will become apparent from a consideration of the following influences upon prices and interest:

First: Of the four classes of bonds, those which have been on the market the longest and have been known to several generations of investors tend to sell at higher prices and to yield less interest.

Second: At times one of these classes is more popular than the others for various reasons and for a while may yield comparatively smaller net return in interest.

Third: The volume of securities of a certain class seeking absorption affects somewhat the price and, therefore, the interest.

Fourth: Some classes of bonds are free from local, state or income tax, and some issues are tax free in special states or sections. Such features have a direct bearing on interest rates.

Fifth: Certain classes of bonds, and some special issues, are legal for the investment of savings banks and trust funds. And this large, special market will absorb such bonds at low interest rates.

Sixth: Speculative features of bond issues greatly affect interest return. Bonds, convertible into stock, possessing voting privileges, or holding key positions in the financial structure, may sell at prices which give the investor an interest return smaller than that of the soundest bond, and yet have little permanent value or security.

Seventh: The size of the issue has considerable bearing. Large issues, running into many millions, usually yield less interest return than small issues of equal security.

Eighth: Geographical location of the property and even of the municipality affects price and interest. Properties, whether public utilities, railroad, or industrial, and cities and towns, remote from investment centers, must pay higher rates for borrowed money than others nearer and better known.

Ninth: Immediate marketability is a strong influence. Bonds which can be sold at a moment's notice will yield less in interest than safer bonds with less ready market. Bonds listed on the New York Stock Exchange are likely to sell at higher prices than unlisted bonds, owing to the entirely erroneous belief that the mere fact of listing ensures marketability.

Tenth. It sometimes happens that very sound bonds are selling cheaply because the market has been broken by some occurrence, such as failure of the house or houses offering them, disaster in allied industries, or some other special influence.

Eleventh: The investment banker offering the bonds for sale sometimes influences the price. Some bankers customarily sell bonds at a little higher price and consequently a smaller interest return than do others. It is for the investor to decide whether the service rendered warrants a higher price.

Twelfth: Safety of principal undoubtedly has a bearing on the interest return, but there are so many other influences at work that no dependence can be placed upon the rate as an indication of security.

It is necesary to understand these various influences before an intelligent study can be made of any one class of bonds and the prevailing interest return thereon. In considering public utility bonds as a class, it is desirable to examine into the elements of safety and interest. If it can be determined that public utility bonds are as sound as other bonds and yield a better rate of interest, there remains no doubt that this class of bonds meets the demand of the great majority of investors.

In this study the safeguards of public utility bonds should be steadily borne in mind.

First: Public utility bonds are the only bonds where both the amount of securities and the rates at which the product or service is sold are regulated by the State. This regulatory power and practice is of inestimable value to the investor. Public Service Commissions, created by the people, through State Legislatures, having determined the amount and types of securities issued on public utility properties, are bound to see that the charges for the service rendered are liberal enough to yield a net income sufficient to pay interest and dividends on the money invested.

Second: Gas, electric light and power, and even traction service, are public necessities. They must be provided and used whether the industrial and economic conditions be good, bad or indifferent.

Third: Furthermore, it has been shown by past experience that companies furnishing light and power maintain their earnings in depressed times, and generally even show gains when all other classes of business display sharp declines in revenue.

Fourth: Earnings are steadily increasing. Customers already connected with the plant use an increasing amount of the product. New customers are constantly being made. In addition the uses of the product are increasing in number and variety, and the field for extension of business is almost unlimited.

Fifth: Securities issued as they are, under the supervision of Commissions, are based on the reproduction value of the property, and, therefore, represent no inflation. The bonds are issued only to an amount less than such real values and so have a safe margin of equity.

Sixth: Public utility business is not competitive. It is a regulated monopoly. The Commissions will not permit competing plants, while, at the same time they grant rates to existing companies which ensure fair return on capital.

It appears clear from these facts that public utility bonds are the ideal investment from the viewpoint of

security. So much for the soundness and stability of this class of investment.

Now what of the interest return? An examination of the records shows that bonds of companies furnishing light and power yield the investor from one to two per cent more interest yearly than do good railroad and municipal bonds, and cannot be compared with industrial bonds as the latter differ so one with the other that they cannot be treated as a class.

Since it is evident that public utility bonds are secure, and since it is also well known that they yield better rates of interest than most other good bonds, it is interesting to consider the reasons why they give the investor better returns on his money.

First: Public utility bonds are a product of the present generation and the great bulk of securities have been issued during the last twenty years. They have been thoroughly tested by the most adverse circumstances and have proved worthy, but as a class they have not been so long in the public eye and mind as railroad and municipal bonds, and are, therefore, not intimately known to many slow moving investors. They are not so broadly held and understood.

Second: Until recently they have not been so popular among investors, partly because they were not so generally known, and partly because the slogan of rails and municipals had been long and well sounded.

Third: The growth and extension of their properties has been exceedingly rapid and the demand for funds has been almost overwhelming. This pressure of demand for funds, falling upon a partly awakened and perhaps unappreciative investing public, has inevitably tended to keep the prices of these bonds less than their comparative value, resulting in gain to the investor in point of interest.

Fourth: Bonds of this character have not been as a rule free of local, state and national taxation, and this fact has caused them to sell at lower prices than bonds having provisions freeing the holder from taxation. Now, however, and very rapidly, States are passing laws imposing a small tax on all bonds, and this movement will tend to cause rising prices in this class of bonds.

Fifth: Furthermore, bonds of this character have not until recently been legal for savings banks and trust funds in many states. Quite recently, however, a considerable number of states have legalized for these purposes bonds which meet certain requirements and bills of similar import are in preparation and will be passed this winter in many more states. This will open a broad field for these bonds and the interest return will tend to decline.

Sixth: Public utility bonds have no speculative features whatever. There is, therefore, no speculative demand and consequent rise in price. There will be, however, a steady upward trend in price due to the various causes cited.

Seventh: Moreover, the issues are as a rule small. Issues running into many millions are indeed few in number. While there is an increasing tendency to assemble the properties into large corporations, this movement has as yet scarcely begun. With larger issues will come broader markets, rising prices, and diminished interest return.

Eighth: The United States is growing in population and industrial activity, outside and beyond the large investment areas. And this fact, too, has a bearing on the price and return of investments seeking a market for the most part within these areas.

Ninth: Public utility bonds have only just begun to have a broad national, and, to a less extent, an international market. Not yet do they have immediate marketability, except in a few instances, though they have attained a ready market and good currency. But the day of immediate marketability is fast approaching and the interest return, subject, of course, to economic conditions, will steadily decline.

Tenth: For a long time banks and old established investment houses held somewhat aloof from public utility bonds until their soundness was thoroughly proved and until public service commissions to regulate securities and rates were created in most states. Now practically all trust companies, national banks having bond departments and first class investment banking houses are recommending these bonds to their clients.

The fact that public utility bonds are thoroughly sound; the reasons why they are yielding investors better interest returns than nearly all other bonds of equal security; and the practical certainty that the present high interest return is temporary and will trend downward steadily, should be quite apparent. This class of securities is passing through a phase which gives a rare, but comparatively temporary opportunity for investors. It is probable that there will not be an equivalent opportunity for at least a generation or more.

PUBLIC UTILITIES IN THE LIGHT OF PRESENT CONDITIONS.

Financial Expert Sees Present Time Most Favorable for Investment in Utility Securities.

Conditions of the investment market in view of government control plans now taking form, are thus analyzed, from the standpoint of the investor in public utilities, by L. P. Hammond, of Bonbright & Company, New York, N. Y.

The present condition of the investment market is puzzling to insiders. The United States is holding more gold than any other country is known to have held in the history of the world, bank clearings are at an unheard-of rate, the steel companies' orders are far in excess of any estimated possibility in that direction, and all other usual barometrics point to unheard-of prosperity. It is evident that there is plenty of money in the country and that the stagnation must be due to psychological causes. In plain words, the investor is apprehensive.

It is reasoned that this apprehension must be due to uncertainty of the effect of governmental regulation of business as a war measure.

Public utility securities have acted in sympathy with the market, and many exceptionally well-secured investments are available at unusually high rates of return. The critical investor should be appealed to by the fact that public utility corporations are practically assured of very little disturbance through regulation, because the industry as a whole has now been under governmental regulation by the individual states for some years and it has adjusted itself to such regulation. In this industry practically all of the complicated and serious problems necessary to establish proof that earnings constitute a fair return upon a fair value, have been worked out. Where the result did not fit in with earnings, the necessary adjustments have been made.

The industry therefore not only will be exempt from adjustment of earnings, but also from the evils of ill-advised or uninformed efforts of newly created regulatory bodies.

Hydroelectric Plant of the Cerro de Pasco Mining Company in Peru

Description of Interesting South American High-Head Power Development for Mining Property—Plant Located in Mountains About 12,000 Feet Above the Sea

WITH the rapidly increasing electrification of its operations at mines and smelter, the Cerro de Pasco Mining Company, an American corporation with headquarters at Cerro de Pasco, Peru, South America, found it necessary to provide considerably more power than that afforded by its already extensive steam plant. Accordingly surveys were made to determine what power could be derived from the Yauli River, a stream rising in the high range which includes Mount Meiggs.

This led to plans for the location of a hydroelectric plant near the railway junction of Aroya, and a thoroughly modern power station has been constructed there.

Head Works, Reservoir, Flume and Pipe Lines.

At Chaplanca a concrete dam, 72 feet high from the base, has been built, and by this means about 1590 gallons of water is diverted per second through an open flume and pipe line 10½ miles long. Included in this conduit are four tunnels and an inverted siphon made necessary by the topographical features of the route. The last named carried the water across Saco Quebrada, a deep gulch, where there is a vertical drop of nearly 250 feet and a loss of over 7 feet in head. About 4½ miles of the flume is lined with rubble or concrete, and 3490 feet has been built of wood. The average grade is one-tenth of one per cent.

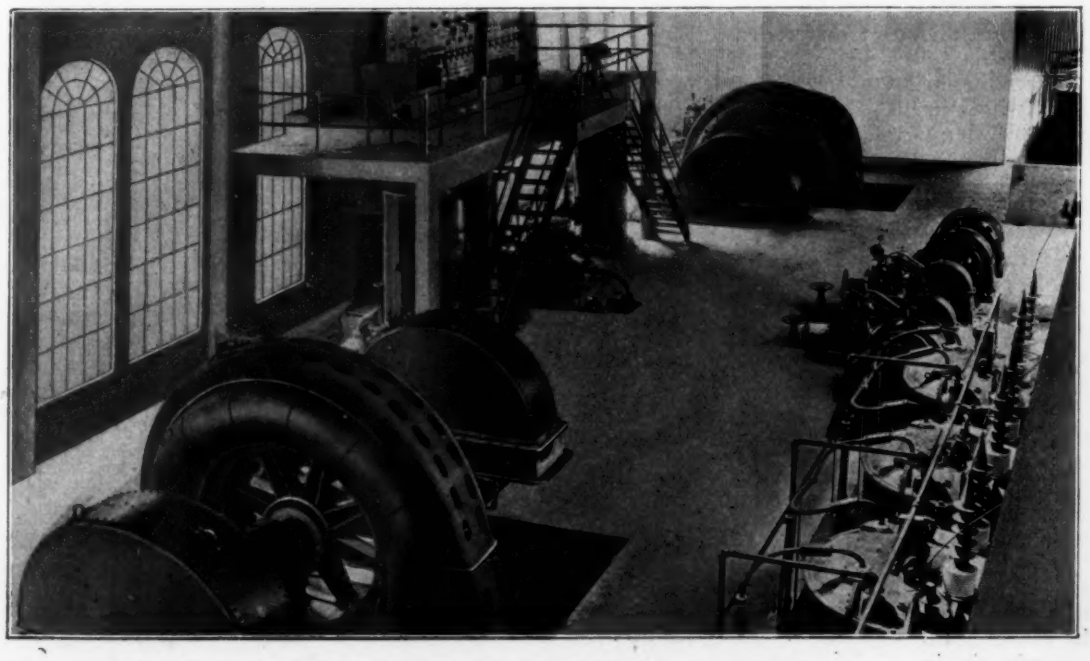
At the end of the water conduit there is a reservoir or forebay excavated out of the mountain above the power plant. This has a surface area of about 13 acres and will impound nearly 12,000,000 gallons of water, or enough to keep the plant running 2½ hours, in case the water should, for any reason, be shut off from above. This will allow sufficient time to get the company's auxiliary steam plants in full operation, so as to prevent any interruption to the service.

From the forebay the water falls 720 feet through a steel penstock, suitably protected by gate and screen. This pipe has a length of 4700 feet, 1420 feet of which is on the steep mountain slope; so that concrete anchor blocks and massive steel bands are required. It is 42 to 62 inches in diameter and 3/16 to 9/16 inch thick.

The Power House.

The power house, which is a reinforced-concrete building 120 by 46 feet, was placed parallel to the river and at a right angle to the main pressure line. It is constructed at present for three main units, which are placed with their shafts in one line longitudinally in the power house. One side wall of the power house is temporarily made of corrugated iron, so that the fourth unit can be added later. The station now contains three main units, two water-wheel-driven exciter generator sets, four transformer pits and a central oil-pressure system for the governors, above which the switchboard is placed on the gallery. A crane to lift 25 tons runs the full length of the building.

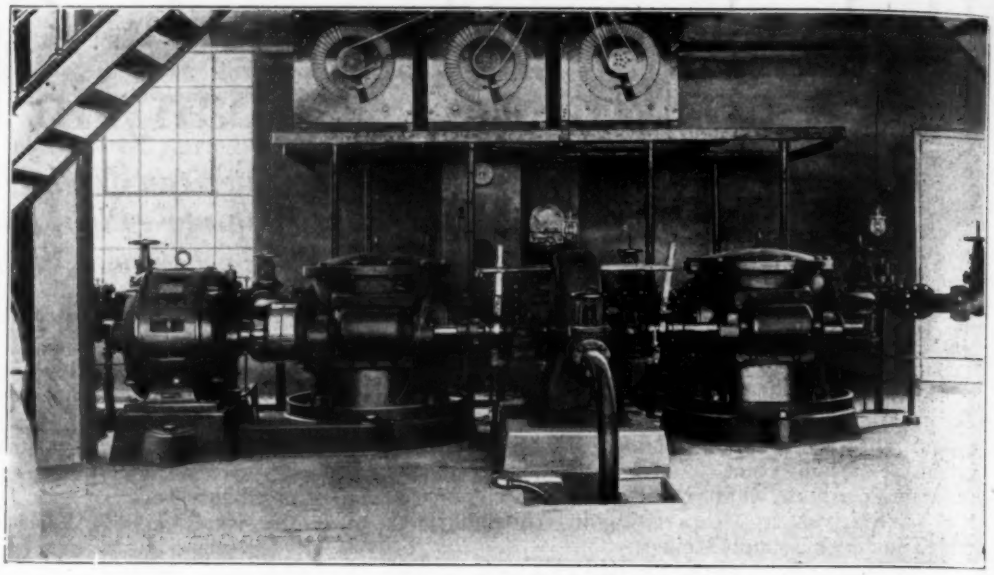
The penstock above described ends in a "Y" piece with the two 30-inch branches placed at 90 degrees and to which are connected 30-inch gate valves. These feed six 24-inch pipes, each equipped with a gate valve, which supply either end of each hydraulic turbine.



Interior of Hydroelectric Power House at Owya, Peru.

The valves are of the extra heavy outside screw and yoke standard design, hand-operated and provided with small hand-operated by-pass valves, so that the nozzle pipes can be put under penstock pressure before opening the main gate valves.

An extension of the pipe leads to an elbow which connects to the fourth 24-inch gate valve at the outer end of the power house. The branch for the fourth future unit has not yet been installed, although provisions have been made for it.



Central Oil-Pressure System for the Governors.

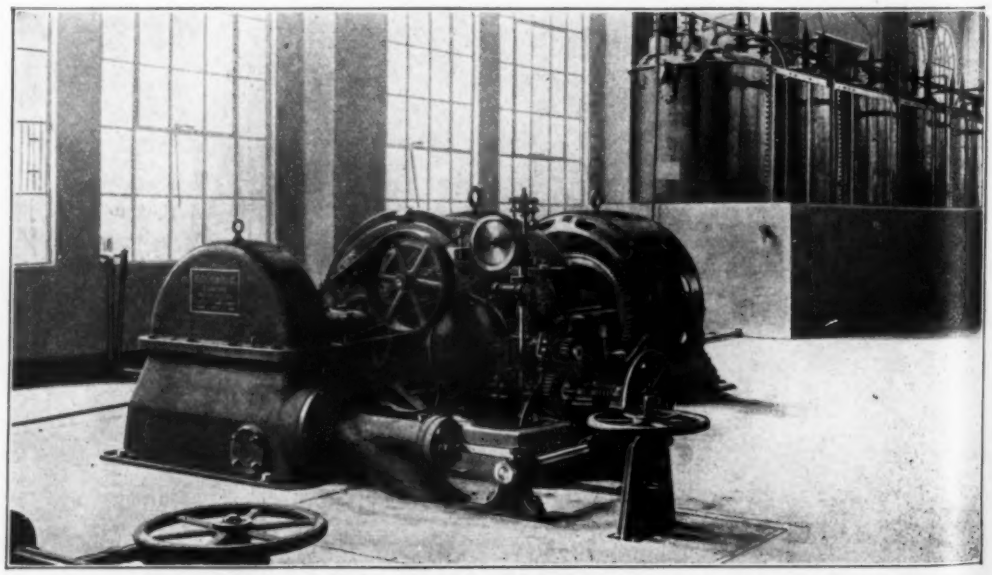
Main Turbine Units.

The three main units are designed for a maximum output of 5000 brake horsepower under an effective head of 700 feet, at 300 revolutions per minute. They are of the double-overhung impulse type, with governor-operated deflecting nozzles and hand-adjusted needles. The unit is placed with its shaft sufficiently low so that the jet when deflected or passing through the buckets at the runaway speed can discharge free into the tailrace, as is shown on the accompanying view taken when the nozzles were fully deflected from the wheels. The generator shaft rests in two ringoiling, ball-and-socket seat, babbitted-shell bearings and is flanged on each end to receive the steel wheel disks, carrying the buckets individually bolted to same. The buckets are made of annealed steel and interchangeably machined. Tests made with this design showed efficiencies as high as 89 per cent. They are fastened to the disk by three taper-fit bolts of ample size to prevent crystallization of material.

The deflecting nozzles are practically identical in design with those furnished by the same manufacturers for the four 10,750-horsepower units of the Kern River plant No. 1 of the Southern California Edison Company at Los Angeles. The design of this nozzle is such that the reaction of the jet coincides with the center line of the stationary pipe so that no eccentric force is imposed upon the trunnions of the swivel head. The nozzle tip is provided with a removable throat ring which can be changed to suit conditions of maximum load required at different times. The needle carries a removable tip and its hand-operating device is combined with a hydraulic arrangement which can be so manipulated that it is exceedingly easy to turn the handwheel, whether closing or opening the needle. The swivel head proper is so designed that the exchange of the cup leather of the joint can be done without lifting the removable part of the deflecting nozzle out of place. The wheel housing has its lower cast-iron portion grouted into concrete and its steel-plate cover flanged to the lower portion. The pit is lined by steel plates bolted to angle irons set into the concrete foundation.

Governors and Exciter Units.

The governor is of the oil-pressure type belt-driven from the main shaft and its oil pressure supplied from a central oil-pressure system. The governor operates the two deflecting nozzles of the unit through a common regulating shaft. The relay of the governor can

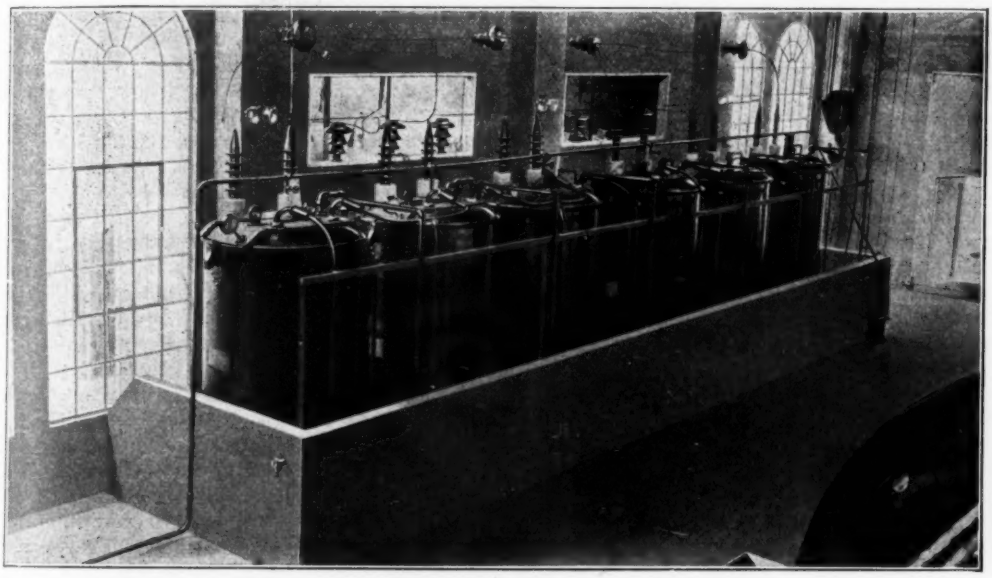


One of the Exciter Sets With Both Water Wheel and Motor Drive. Transformers at Right.

also be controlled electrically from the switchboard. The deflection of the jet, whereby the velocity in the pipe line is never changed, allows of the quickest closing and opening time of the governor, and thus excellent results of speed regulation are obtained. The relay of the governor is so designed that the speed of the unit is held within three-quarters of one per cent for a gradual load change from full to maximum, or vice versa.

The sensitiveness of this governor is such as to cause a motion of the deflecting nozzle at a very small fraction of one per cent speed change. The governor is also provided with an independent mechanical hand-operating device, which in case of inspection or repair of the governor mechanism allows the continued use of the unit for production of power.

The exciter units are placed in the center of the power house on the downstream side midway between the two pairs of transformer pits and opposite the switchboard. They receive their operating water from a feed line which is tapped from the two inner 24-inch pipe lines and so arranged that they can be connected to either of the two or to both branch lines. This is accomplished with the 5-6-inch heavy gate valves inserted into the system. The wheels are of the single horizontal overhung type with stationary nozzle directly operated by hand or by the mechanical governor. They are built for a maximum output of 200 horsepower when operating under 700-foot effective head at 900 revolutions per minute. The wheels, with the exception of the nozzle, are built similarly to the main units.



Six of the 1,000-Kilowatt, 55,000-Volt Transformers.

Central Oil-Pressure System.

The central oil-pressure system is placed into the hillside center of the power house and designed to furnish sufficient oil for the governors of the four main units of the completed plant. With governor systems it is not so much a question of high efficiency of the pumps as it is of absolute reliability and service and of great accessibility. The manufacturers have developed rotary geared oil pumps which are particularly well adapted for this service. Two of these pumps are used, each of sufficient capacity to furnish the necessary oil for four governors under the maximum pressure of 250 pounds. They are so arranged that their adjacent ends can be coupled by clutches to an impulse wheel, while one of the remaining ends is directly connected to a 35-horsepower induction motor. That pump which is in operation is connected to the impulse wheel, which has its jet so adjusted that it will keep its pump under normal speed. Under normal conditions, therefore, the induction motor requires no current, so that no power is wasted. Two pressure tanks are provided and one two-compartment oil receiving tank, all so connected that they can be used in any combination desired. Since so much capacity of the oil system is provided that it will be sufficient for the most severe operating conditions, it would naturally be too large for conditions of operation under smooth load changes only. This would be a waste of power were it not for the special unloading valves used in this system. These valves are of the differential type, allowing the pumps to discharge at almost no pressure until the pressure in the tanks has dropped to the lower limit, at which time the valve closes the free outlet and causes the pump to discharge into the pressure tank until the pressure is restored.

Generators and Exciter Sets.

The three 3750-kilovolt - ampere, 60-cycle, 2300-volt, three-phase generators are each driven at 300 revolutions per minute by two 2500-horsepower impulse water wheels overhung from each end of the unit, as stated. The flange couplings are designed for direct attachment to the runners. The stator and pedestals are supported on sole plates. Forced ventilation is effected by fans; these are aluminum castings especially designed for this particular capacity and speed. Contrary to the belief of many ventilating fans do not produce a loss, but definitely increase the efficiency of the process of ventilation which is so necessary for all machines. The guaranteed efficiencies were 87 per cent at one-fourth load, 93 per cent at one-half load, 95.1 at three-fourths load and 96.1 at full load. The actual efficiencies were 88.5, 93.7, 95.5, 96.4, 96.9 and 97.2 per cent.

A substantial end construction was made use of by which the ends of the coils were fastened to a stout ring completely surrounding the end windings of the stator; this is for the purpose of preventing the collapsing of the coils should the machine have any short circuits.

The plant includes two motor-driven exciter sets of 150 kilowatts capacity. The motors, which are of the induction type, were wound for 2300 volts so that they can take the current from the generators directly without need of intermediate transformers. Additional data on the electrical features will be given in a latter issue.

The Automoblie Headlighting Problem

A Brief Statement of Present Conditions with Recommendations for Ideal System Which Would Overcome Present Deficiencies

By EVAN J. EDWARDS

Manager Engineering Department, National Lamp Works.

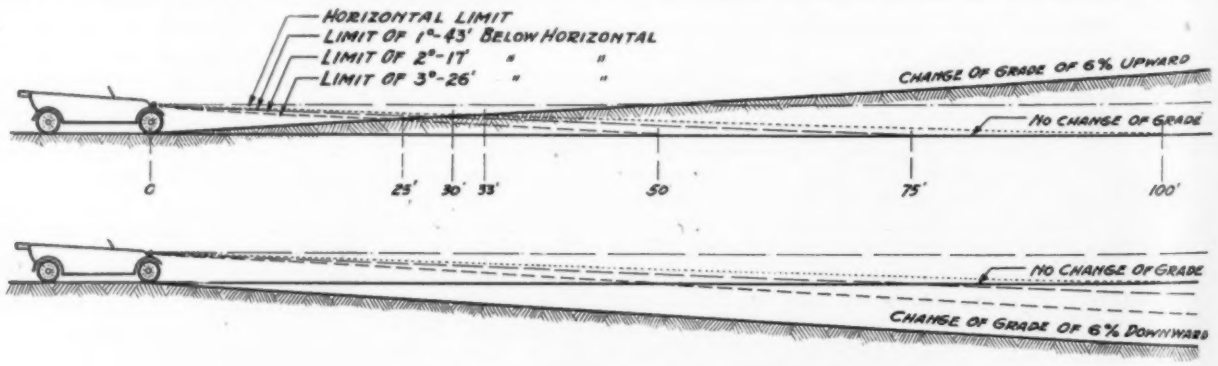
FOR some time now there has been apparent effort to cast out the glare devil from automobile headlights. After this evil spirit of the headlight was discovered and duly named, it rapidly grew up to be a terrible monster known far and wide as hungry to cause distress and even death. Yet many hold the opinion that the conditions, particularly on the country roads, are less satisfactory now than they were before any attention had been attracted to the problem of glare.

There apparently exists a considerable confusion of thought in the minds of those who are interested in the problem. There are but few clear cut points of agreement or disagreement. There seems to be a lack of attention to the fundamentals underlying the problem, and a tendency to look for the solution in the appearance of a patented device more or less mysterious in character. Greater progress would, no doubt, have been made if more consideration had been given to the seeking of conclusions as to what might constitute ideal headlighting, all standpoints considered, and without regard to any kind of device. The laws of light are well known and the art of controlling light is well developed, and there is little doubt that once the ideal distribution and method of control of the light were determined upon, a variety of suitable devices to accomplish the desired results would soon appear.

Perhaps the most carefully considered effort, at the present time, is by the committees of certain technical societies. The Illuminating Engineering Society has a special committee for the consideration of this problem. The Society of Automotive Engineers has a subcommittee of its Standards Committee working on this as well as other features of automobile lighting.

Present Conditions Unsatisfactory.

Many states and cities have laws designed to regulate the use of automobile headlights to the elimination of dangerous glare. Some of these laws have been in effect for more than a year but in the opinion of the writer they are not working successfully, particularly as regards driving on unlighted streets and roads. This is evidenced by the fact that country drivers frequently complain that conditions are worse at the present time than they have ever been before. Before the glare question was agitated the driver was often inconvenienced by the glare from distant unmodified paraboloid head lamps but he was still able to see his way because he was not called upon to turn off his own lights, and as he came within 100 feet or so of the other driver he was fairly certain of being outside the narrow beam of high intensity. At the present time a considerable number of machines are equipped with devices which are supposed to be glareless but which in fact are only slightly less glaring at a distance and more glaring nearby. Some of these drivers, and all of those whose machines are not equipped with special devices, feel called upon to turn out their headlights and while they accomplish the elimination of glare they expose the eyes of the approaching driver to such a sudden change in conditions that he is unable to see anything for some sec-



LIMITING ANGLES OF TOP OF BEAM

	HORIZONTAL	1°-43' BELOW	2°-17' BELOW	3°-26' BELOW
DISTANCE ILLUMINATED FOR NO CHANGE IN GRADE	∞	100 FT.	75 FT.	50 FT.
DISTANCE ILLUMINATED FOR 6% CHANGE UPWARD	50 FT.	33 FT.	30 FT.	25 FT.
DISTANCE ILLUMINATED FOR 6% CHANGE DOWNWARD	∞	∞	∞	∞
HEIGHT ABOVE ROAD AT 100 FT. NO CHANGE IN GRADE	3 FT.	0	-1 FT.	-3 FT.
HEIGHT ABOVE ROAD AT 100 FT. FOR 6% CHANGE UPWARD	-3 FT.	-6 FT.	-7 FT.	-9 FT.
HEIGHT ABOVE ROAD AT 100 FT. FOR 6% CHANGE DOWNWARD	9 FT.	6 FT.	5 FT.	3 FT.

Sketch Showing Variation of Throw of Height of Beam for Three Conditions of Road Profile and Four Limiting Angles of Beam Headlight Assumed to be Located Three Feet Above Road.

onds afterwards, and is, himself, unable to see the road because of the lack of sufficient light. The so-called courtesy of the road, while very nice from some standpoints, has as a net result left conditions worse rather than better. When two machines, with reasonably well focused head lamps, meet on a dark country road it is believed by many drivers to be easier for them to pass each other in safety with their lights on.

There are many things to be considered. The answer cannot be the best from individual viewpoints, such as the driver, other drivers, pedestrians, etc. It is apparent that there are certain opposing factors involved in the solution of the headlight problem. Therefore, the solution must be one of compromise and somewhat a matter of opinion in weighing the several factors involved.

Conditions to be Met.

There is one point of nearly general agreement among those who have studied the problem. It is that it is impossible to get sufficient road illumination with the highest candlepower values which can be allowed in the direction of the approaching driver's eyes. The curve on page 548 represents the writer's experience in estimating glare effect as a function of headlight candlepower on a dark country road. There is marked interference with vision even at very low intensities where the background is dark. A 1000-candlepower is no doubt a satisfactory upper limit as regards glare on well lighted streets in a city, but on a dark country road 100 or 200 candlepower seriously interferes with vision. If a headlight system is to be satisfactory for country driving it appears necessary to practically eliminate all upward light at the time of passing other vehicles.

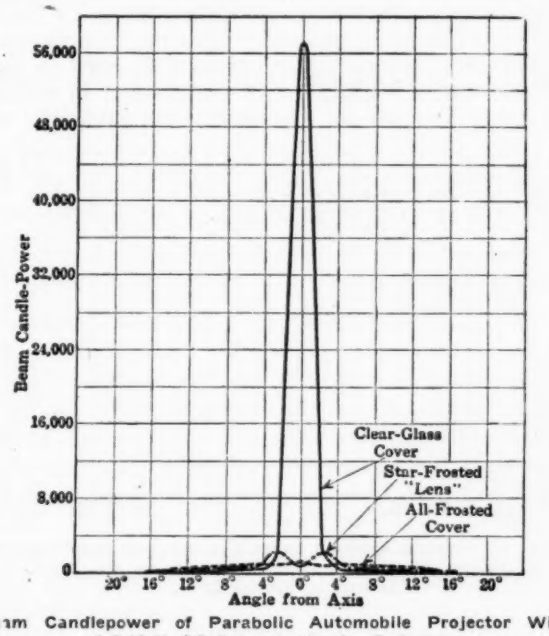
In order to secure safety in night driving it is just as essential to have sufficient light on the roadway as it is to avoid glare to other drivers. To get sufficient intensity on the road it is necessary to use a beam of many thousands of candlepower. It is only very recently that there seemed to be any general agreement that proper road illumination could be obtained only with candlepowers higher than were allowable in the angles which can cause glare.

Most of the laws which now exist are indefinite but practically all are aimed at limiting the intensities which can be used in the upward angles. Most of the attempts to meet the requirements of existing laws are unsuccessful from the standpoint of the drivers because either the upward intensities are not sufficiently reduced to eliminate glare or the road illumination is not sufficiently good for comfortable driving. Again, some of the devices are designed to give long range as a matter of better satisfying the purchaser, and in attempting to give a long range the designers have allowed considerable light above the horizontal and so much light in the region of the horizontal that due to variations in loading of the machine, and due to the varying curvature in the profile of the roadway, they often cause serious glare. Even on the level road there is bad glare from the stray light in the upward angles if the background is very dark.

It would seem that the only possible solution in passing other vehicles is to have a distribution so that good illumination is produced on the road immediately forward of the machine, to practically eliminate all upward light and to limit the angle for the high intensities sufficiently below the horizontal to provide a factor of safety as regards changing loads in the machine and varying curvatures of the road surface.

An Ideal System.

Coming then to a consideration as to what might constitute an ideal automobile lighting system, we would say that the machine must be equipped so that in passing other machines it is capable of giving good road illumination up to 75 feet ahead of the car and of a width sufficient to cover the roadway, say 15 or 20 feet. The light from the upward angles should be reduced to the absolute practicable limit. The upper limit of the high-intensity beam should be depressed about two degrees below the horizontal as a factor of safety to insure no-glare under practically all conditions of road curvature and loading of the machine. It woud give good road illumination nearby which is essential to safety in passing. It would eliminate glare by the elimination of the light in the angles where might be found the eyes of the approaching driver. There can hardly be a question that such



Beam Candlepower of Parabolic Automobile Projector With 6-8-Volt 3.0-Ampere Mazda C Lamp.

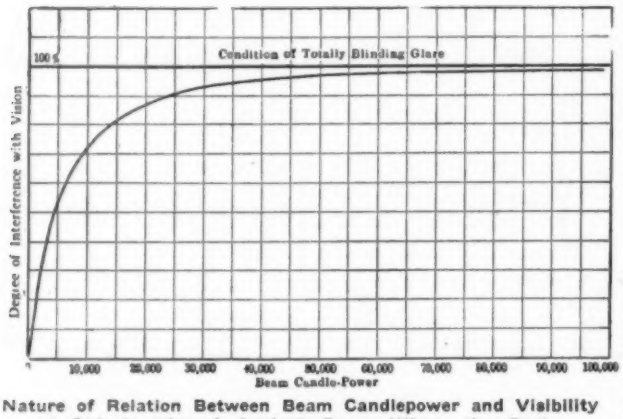
a system would be satisfactory insofar as the passing of other vehicles is concerned.

Such a system, however, if fixed in position and the only one to be provided, would be very unsatisfactory from certain other standpoints. It would not have sufficient throw to permit of speeds that are often desirable. It would not give warning at a distance to the approaching driver on a cross-road. It would not give pedestrians warning of the approach of the vehicle. It would not give the sense of security and pleasure in night driving that is obtained by the illumination of distant objects in the upward angles. It would not allow a satisfactory range of vision when approaching the foot of a hill. All of these disadvantages are important and some of them are materially concerned in the question of safety. All of them are disadvantages common to all systems where the upward light is reduced or eliminated, and are serious to a degree inversely in proportion to their effectiveness from the standpoint of elimination of glare. None of these disadvantages appear in the standard parab-

oloid headlights, therefore, it would seem that the ideal system would be one capable of more than one kind of distribution. The points involved are of sufficient importance to bring the conclusion that a satisfactory automobile headlighting system for both country and city driving can never be obtained with one fixed distribution of the light. At times when there are no eyes ahead to be blinded the maximum of safety and satisfaction in night driving can only be obtained with a long-range system giving high intensities above, as well as below, the horizontal. It would seem that the most important compromise necessary is to require the driver to temporarily dispense with the advantages of his upward light at such time as he is meeting other vehicles. This means that on the much used road he may not be able to use his upward light at all, whereas on the country roads in the greater part of the country he can have the advantages of his upward light most of the time.

This ideal lighting could, of course, be obtained with a double system controllable by the driver by means of electric switches. It could also be obtained with a single reflector system adjustable as to limiting upward angle in some way from the driver's seat.

The ideal system above proposed is open to one very serious objection. It is that proper operation must depend upon the knowledge and intentions of



Nature of Relation Between Beam Candlepower and Visibility of Objects Viewed Against Beam Where the Background is Totally Dark.

the driver. There would, no doubt, be many cases where such equipment would be misused due to ignorance or malice on the part of certain drivers; however, this point is hardly more serious than the fact that all the other operations in controlling an automobile are at the discretion of the driver. The disadvantages of having them otherwise are so great that it seems that the control of the machine will always have to be entrusted to the operator. It should be remembered in this connection, however, that if machines were provided with an effective no-glare system for passing other vehicles that the incentive to abuse the privileges of having a high-powered upward light system would be largely eliminated.

These brief statements can be criticised from the standpoint that they represent merely the opinion of the writer. The final accepted solution will be largely a consensus of opinion and it is therefore hoped that the ideas here expressed will bring forth other opinions. There are no enthusiastic claimants that the present situation is satisfactory, while there are almost as many as there are drivers on the road who are dissatisfied. This indicates no generally agreed upon solution yet exists.

Storage-Battery Locomotives in Coal Mines Relieve Serious Labor Shortage and Effect Big Economies.

About 1100 new coal mines have been opened in the United States in the past fifteen months, and the question of labor is at present the chief problem of the coal industry.

One of the ways to meet this labor problem is to introduce machinery and labor-saving devices. The electric industrial truck and the storage-battery locomotive meet this emergency satisfactorily.

Today storage-battery locomotives are being used both for gathering service and for main haulage. As one of these "electrics" will do the work of 3 to 8 mules, it displaces a large number of drivers who can be more profitably employed at the coal face. The cost of hauling coal and ore with storage-battery locomotives is only about one-half what it costs to haul with mules or horses, and the mine output can be materially increased and the sanitary conditions improved by the use of this electric vehicle.

The Madison Coal Corporation, one of the largest coal-mining corporations of the middle West, which strongly advocates the use of the electric locomotive in coal mines, based on actual operating experience states that in addition to the money saving in ton haulage, there is a remarkable financial economy in the prevention of injuries, for while their mule drivers form only 5 per cent of their entire working forces, their accidents amount to 26 per cent of the whole number, and the cost in connection with them amounts to 34 per cent of the total liability cost. Some comparative monthly costs from this company follow:

COST OF GATHERING COAL WITH STORAGE-BATTERY LOCOMOTIVES AS COMPARED WITH MULES, FIGURING THAT THE "ELECTRIC" DISPLACES FOUR MULES.

MULES.

Feed and feeding 4 mules	$ 69.44
4 drivers, 162 hours each	230.04
Blacksmithing for 4 mules	3.84
Depreciation, 4 mules, life of mule 5 years	14.28
Veterinary and medicine, 4 mules	3.60
Harness	3.60
Driver boss, 4 mules	18.00
Total cost to maintain 4 mules with drivers	$342.80
Tonnage gathered with 4 mules during one month, 8,363 tons	
Cost to gather with mules and drivers	$0.04096

STORAGE BATTERY LOCOMOTIVE.

Maintenance cost of batteries, one month	$ 30.00
Maintenance cost of mechanical equipment, one month	12.50
Motorman, 162 hours	68.44
Trip rider, 162 hours	57.51
Charging batteries, 20 hours, one hour each night mine work	6.55
Oil	.20
Cost to maintain S. B. locomotive one month	$175.70
Tonnage gathered with S. B. locomotive during one month, 8,900 tons.	
Cost to gather with S. B. locomotive during one month.	$0.01974
Current, 73 K. W. H. at 1½c per K. W. H.	.00125
Total cost to maintain and gather with S. B. locomotive	$0.02099
Cost to gather with mules, per ton	$0.04096
Cost to gather with S. B. Locomotive, per ton	.02099
Difference in favor of electric locomotive	$0.01997

The Pocahontas Smokeless Coal Company of West Virginia is also successfully operating storage-battery locomotives. At its mine four cars, each weighing 1300 pounds empty, and 4100 pounds loaded, are hauled on each trip by one electric storage battery locomotive, on main entry, a distance of about 2500 feet, including 1200 feet against 3 per cent grade, 400 feet against 2½ per cent grade, and short grades of 5 and 7 per cent, all against the loads. To secure the 400 tons a day that this mine should produce, the mule haulage would cost $735 a month and battery haulage $306 a month, making the very substantial saving of $429 a month in favor of the "electrics."

Editorial Comment

Lifting The Copper Burden

ALLOWING for the fact that operating costs are now considerably above what they were prior to the war, the price of 23.5 cents a pound named for copper appears to be sufficient to give all of the producing companies a substantial margin of profit and at the same time free the electrical industries from the unreasonable burden which they have recently been carrying.

The average cost of production at the present time is estimated by the trade at 16 to 18 cents per pound. Some companies do much better and other not so well, depending on the different methods of operation and varying conditions at the mines. Outside the trade an unprejudiced estimate puts the average production cost at not over 14 cents a pound.

It is not surprising, therefore, that little complaint has been heard from the producers.

The expense of producing copper has risen sharply during the last year, chiefly because of the heavier labor and material costs. Figures of 1916 therefore have little value when it comes to calculating the margin of profits. Besides, no two companies arrive at their operating costs in the same way.

Nevertheless, it is interesting to note that last year the Utah Copper Company, one of the largest producers, turned out its copper at a cost of around 7 cents a pound. Kennecott produced copper at a cost of less than 5.5 cents, while Anaconda's output was secured at not more than 12 cents. The cost per pound of net copper produced by the Chino Copper Company for the second quarter of 1917, after allowing for smelter deductions and crediting all miscellaneous income, was 9.65 cents, as against 10.12 cents for the first quarter of 1917. Furthermore, the mining companies now have the advantage of the great increase in the value of the silver content, which is practically double what it was before the war.

Comparing the entire range of prices received for copper since January 1, 1914, it will be found that for several years they ran as follows:

	High.	Low.	Average.
1914	15.00	11.10	13.315
1915	23.00	12.80	17.47
1916	31.89	23.865	27.202
7 months 1917	31.75	26.62	29.315

In 1914 24 companies looking mainly to copper output for their profits paid dividends totaling $36,568,995, with copper averaging 13.315 cents. This too was despite a curtailment in output of close to 80,000,000 pounds.

During 1915 33 companies paid dividends totaling $47,965,537 with copper averaging 17.47.

In 1916, with copper averaging 27.202 cents per pound, copper companies paid dividends many millions greater than in any year in their history.

There is, consequently, no question but that producers have been well paid, and the present price is high enough to encourage maximum output. It will certainly bring a considerable measure of relief to the electrical industries. A feature of the situation not made clear in the announcement of the war industries board is the fact that the new price becomes effective immediately, also that a flat rate to all eliminates the premium on copper for nearby deliveries.

Effect of Steel Cut on Electrical Industries

PROBABLY the most important event of the week was the cut made in prices of iron and steel, including plates, sheets, laminations, and other material used for the manufacture of, or in connection with, power and electrical equipment. Similar action will probably be taken later with reference to tubes, piping, iron and steel cable, etc.

While these prices are far below those recently prevailing, the steel manufacturers have reason to be satisfied with them. Buyers who have contracted for iron or steel at the higher prices must accept delivery at those prices, but this will not be productive of any serious difficulty. As a rule they are protected against declines in the steel market by their own contracts for resale or for finished products in which the steel will be used.

While the prices are subject to revision the first of the year should the occasion require, those chiefly interested believe whatever revision takes place, if any, will be satisfactory, and say the stabilizing of prices in the steel industry, like that in copper, will eliminate competition of the unfair character that has existed since the industry became seriously congested. Fictitious prices and premiums for early delivery made by some mills which took advantage of conditions, will be a thing of the past. Stabilizing of prices will also enable all electrical manufacturers to figure accurately on the cost of this class of material in bidding for contracts or in making their plans for future business.

Twenty-five thousand copies of the order fixing iron and steel prices were sent to manufacturing plants throughout the country, with the request to observe the committee's regulations. In the event that they are not observed the committee will exercise its full authority and hold up railroad shipments wherever necessary.

All production in the country which consumes iron and steel will be divided into three classes. Class A comprises war work, such as the production of arms, ammunition and ships, and material needed therefor. This, of course, includes a great mass of electrical machinery, apparatus and fixtures. Class B comprises work which, while not primarily designed for the prosecution of the war, still is in the public interest and essential to the national welfare. Further electrical lines are comprised in this. Class C will comprise all orders not included in the other two.

Orders and work in class A will take precedence irrespective of the date the orders are given. Classes A and B will be divided into subdivisions, as A1, A2, A3, A4, etc., each comprising orders within its class which are regarded, respectively, as of greater moment. All electrical materials required in the manufacture or use of an article will be classed with the article itself.

Certificates will be issued on application specifying the classification of the work. Certificates of a subsidiary nature will be issued on request for the supplying of material and articles required in the manufacture of the commodity ordered.

War orders of the allies will be placed in Class A, as will those of the United States. Contracts already placed by the War or Navy Department or by the Emergency Fleet Corporation will be placed in subdivision A1; orders already placed by the allies will be put in A2.

Applications for class A certificates will be made by the contracting officer of the United States department making the purchase, and in the case of the allies by their agents. Application for subsidiary certificates, covering materials for class A work will be made by the producer. Applications for class B certificates will be made by purchasers, as will subsidiary certificates in class B.

Through its power to control transportation the priority committee will exercise a general supervision over the placing of contracts for the government, the allies and the public, issuing certificates on which orders may be filled. Similar control over other industries may be assumed later.

The Electrical Security Market

THE uncertainty of the attitude of the Government in regard to price fixing and war taxation has had a direct influence on leading industrial stocks, which has been reflected in practically all issues, public utility included. That there is no logical reason for the present low prices of securities is the belief of many prominent utility operators and financiers. It is true that fuel costs are abnormally high and other costs, particularly of labor, have increased tremendously but on the other hand, the business of most central-station companies has grown to such an extent that dividends will not be impaired in spite of the higher costs of operating. Also, it must be remembered that public utility securities are unique in that both their amounts and the rates at which the product or service is sold are regulated by state commissions. This regulatory power and practice is of inestimable value to the investor since it is the province of the commission to see that the charges for the service rendered are liberal enough to yield a net income sufficient to pay interest and dividends on the money invested. The present time is, therefore, a very favorable one to invest in electrical securities.

The Annual Jovian Convention

THERE is no time in the history of the electrical industry when every man engaged in it can so profitably meet in convention for a discussion of common problems than at present. Every branch of the industry is vitally interested in the welfare of the nation and the successful conduct of the war and every branch is and will continue to be affected by the shortage of labor, the high prices for material, war taxes, and the many other national questions which have arisen.

It is true that the electrical industry is a highly specialized one. The manufacturers have their special problems and have a strong organization in the Associated Manufacturers of Electrical Supplies which is giving special study to existing conditions and preparations for the future. Likewise the electrical engineers, electrical jobbers, contractors and dealers and central station companies have their respective local and national organizations which are invaluable to their members. Nevertheless there is a close relationship between each of these separate branches and now more than ever before there is a crying need for a complete understanding of each others' problems and actual, concrete co-operation so that the electrical industry, which is so vital to the success of the country in its present crisis, can, unhampered by internal disturbances, fulfill its obligations to the nation.

The National Jovian Order is the logical agency for effecting this much desired harmony and the annual convention which will be held in New York City, October 22 and 23, will, as no other convention does, furnish a common ground upon which shall gather all branches in the electrical field for the charting of co-operative effort to advance those endeavors which affect the industry as a whole.

Stripped of all unessential details, and with a seriousness of purpose characteristic of the times, the convention under the leadership of Henry L. Doherty should accomplish a great deal towards devising a thoroughly workable plan whereby Jovianism may be immediately employed to develop to the maximum degree a spirit of intercommunication between all divisions of the industry. Attendance at the convention should be the patriotic duty of every man engaged in the electrical business.

HAPPENINGS IN THE INDUSTRY

Southern California Edison Company Sells Local System to City of Pasadena—American Institute Plans—Correspondence Convention of Illuminating Engineering Society—Copper Prices Fixed

SOUTHERN CALIFORNIA EDISON SELLS LOCAL SYSTEM TO CITY OF PASADENA.

Co-operative Adjustment Between City and Utility Ends Long Controversy—City to Buy Power.

Adopting the identical plan by which the Los Angeles power controversy was settled between the city and the Southern California Edison Company, plans were announced on September 18, by C. W. Koiner, engineer of the municipal lighting plant, for the purchase by the city of Pasadena of the Edison system in Pasadena for approximately $500,000.

Under the terms of the contract the Edison system is to be leased to the city for two years, after which the city will purchase it and, as a condition of the sale, will for thirty years purchase power from the Edison Company at wholesale. This plan will permit the use of hydroelectric power and will save the city the necessity of purchasing oil at the present high market price for the manufacture of current.

Details of Merger.

In his report made public Mr. Koiner points out that the settlement planned will remove more than 6000 duplicate poles from the city streets and will eliminate the waste due to competition that has been strangly the growth of the municipal plant. Mr. Kiner's report covers the following points:

Value of Edison distributing system in Pasadena, $500,714.79, payable in cash at the end of two years' lease.

The city to agree to purchase power for a period of thirty years, the rates for same to be fixed now for the first ten years and revised every five years thereafter, or, in case of disagreement, to be fixed by the State Railroad Commission.

The Pasadena steam plant to be shut down and operated only as needed, or at the order of the Edison Company.

Pasadena to agree to confine itself to the distribution of electrical energy to the city and to agree to sell to the Edison Company its distributing system outside the city, with some exceptions.

Extensions to both systems during two-year-lease period to be made under contract.

As rental for the company's system Pasadena would pay to the Edison Company an amount equal to 8 per cent per annum on the agreed purchase price and 3.36 per cent per annum to be held by the city as depreciation reserve.

The Edison Company is to assume the unexpired term of lease on its office in Pasadena.

W. A. Brackenridge Favors Merger.

W. A. Brackenridge, vice-president and general manager of the Southern California Edison Company, in commenting on the sale, said: "I have examined the report made by Manager Koiner to the Pasadena Commissioners covering the matter of the settlement of the power difficulties in Pasadena and believe that he has made a clear and concise statement of the entire situation.

"If ever there was a time in the history of the nation when co-operation in every line is imperative that time is now, and it would be almost criminal for the Edison company to hold out against a settlement which would eliminate the waste of duplication in distributing systems, particularly when copper is in such demand for war purposes.

"We find the great railways of the country being managed co-operatively for the benefit of the government and all lines of food production and distribution as well as every manufacturing interest in the nation trying to do their bit. This settlement is along the same lines.

Will Benefit City.

"I believe that the use of water power in place of oil for the manufacture of electricity for Pasadena will be at least a small aid—at least a drop in the bucket. The elimination of thousands of poles in the streets will benefit the whole city. We can eliminate the duplication in operating expense and in pay rolls and, from our own selfish standpoint, we are glad that this will settle the ten years' controversy.

"The day of co-operation is here. We face a new era in public utility management, and that company which does not co-operate fully and frankly with the public is doomed to failure. It is for this reason that the same settlement—and on practically the same terms—was made in Los Angeles as is now worked out for Pasadena."

AMERICAN INSTITUTE TO DISCUSS INDUSTRIAL RESEARCH.

First Meeting of Season of A. I. E. E. to Be Held in Philadelphia on October 8.

The 333d meeting of the American Institute of Electrical Engineers will be held in Philadelphia, October 8. The general subject of the meeting will be Industrial Research. A discussion of industrial research should prove highly profitable and practical just at this time, when every energy is being focused on problems connected with the progress of a war, which, above everything else, is making use of every scientific advance.

Papers will be read by C. E. Skinner and F. B. Jewett, on the influence of industrial research on the development of electrical industries, and by A. E. Kennelly, on the contribution of universities to industrial research. It is hoped to have a member of the National Research Council present to read a paper on the organizing of engineers, and engineering research in the prosecution of the war.

Afternoon and evening sessions will be held, and

an informal dinner will take place between the sessions. The exact titles of the papers and the place of meeting will be announced later. There will be no New York meeting of the Institute in October.

CORRESPONDENCE CONVENTION OF ILLUMINATING ENGINEERING SOCIETY.

Abstracts of the First Papers Released in a Unique Method of Conducting a Convention.

As already announced, the Illuminating Engineering Society decided this year to dispense with the assembling of its usual annual convention and to hold in place thereof a correspondence convention. The papers that had been prepared for presentation at the annual gathering are being sent in groups to members of the Society, with the request that they be carefully studied and written discussion on them be submitted to the secretary's office within certain time limits.

The first group of papers sent out consists of four papers briefly abstracted as follows:

Presidential Address.

In the address submitted by President William J. Serrill, brief reference is made to the activities of the society and to the necessity, owing to the war, of changing the annual convention as above indicated. Mr. Serrill calls attention to the need of maintaining perfect balance between the three fundamental principles of the society, namely, scientific, commercial and philanthropic. He also shows that the mission of the society is entirely distinct from that of any other organization already in the field. In the numerout other organizations lighting is only incidental, whereas in this society it is its main purpose.

In the second part of his address Mr. Serrill, who is himself associated with the gas industry, discusses very frankly the conditions existing in the gas-lighting field, his object being to show the various obstacles that this has had to encounter and which account for its relative backwardness. Among these especially mentioned are lack of uniformity in the composition and pressure of the gas, insistence on the antiquated candlepower standard, presence of sulphur and other objectionable constituents in the gas, excessive discoloration of walls and ceilings, unsatisfactory policy with regard to giving away of the obsolete flat-flame burners, failure to discourage the use of poorly designed and constructed burners and mantles, poor illuminating engineering on the part of gas companies' salesmen, antiquated system of supplying gas at rates uniform under all conditions of use and lack of aggressiveness in pushing gas lighting.

Nomenclature and Standards.

The report of the Committee on Nomenclature and Standards included a review of the principal terms used in illuminating engineering with either entirely new or revised definitions. Over 60 different terms are so defined as to avoid the confusion or lack of definiteness that may formerly have existed. The report also includes a table of 28 photometric quantities, together with the name of the unit, the common symbol or defining equation, and the abbreviation recommended for the name of the unit.

Illuminating Engineering Publicity.

In a paper by George H. Stickney, president-elect, on the subject, "Illuminating Engineering Publicity," the author makes a strong plea for close adherence to truth in all advertising of illuminating apparatus or products. He shows that the basis of advertising is confidence and unless the reader believes in the advertising, much if not all of its effectiveness is lost. While some advertisers seem occasionally to be intentionally careless in ascertaining the facts regarding their product, in order to avoid giving publicity to their limitations, there appear relatively few instances where deliberate misrepresentation is resorted to. Fortunately such misrepresentation is dangerous and therefore rare. The task of combating it, however unpleasant a duty it is, must be performed for the protection of the art.

Care is necessary in presenting comparisons of competing equipments, which, while valuable to the intending purchaser, must be made with great care and under representative conditions. An advertisement can seldom be given in strictly technical terms, rather it should consist of short, simple statements closely approximating to the truth; when thought and ingenuity are applied a remarkably correct description can be secured without technical terms for even involved phenomena. Exaggeration of candlepower terms must be guarded against. An advertiser must know his product thoroughly before advertising it. Efficiencies of illuminants should be expressed in the present practice of ratio of lumens output to power input. The old expression candlepower per watt should be discouraged. Efficiency taken alone is not a fair basis for lamp selection, unless all other conditions are the same. The desirability should be emphasized of advertising good illumination practice, as well as important merits of apparatus.

Respecting glare, contradictory claims of different advertisers are rather confusing to prospective purchasers and act as a deterrent to sales. Claims as to color value, especially as to so-called daylight color, have been subject to much abuse. When properly applied, photographs of lighting effects are legitimate and effective means of exploiting equipment. Unfortunately photographs present considerable opportunity for deception, both intentional and unintentional. Much skill is required in making photographs represent lighting effect as actually viewed by the eye of an observer. Retouching is to be considered as inadvisable, because it seldom is done without distorting the truth. It is not unusual to see advertising illustrations in which the shadows run in the wrong directions with reference to the lighting units; this usually indicates the use of flashlights or other external lighting sources.

Maintenance of Gas Lamps in Residences.

A paper by E. B. Myers, on the subject "The Growth and Present Status of Systems Used in the Maintenance of Gas Lamps in Residences," reviews the practice of gas companies as to maintaining equipment. Formerly nothing was done in this line. One of the earliest attempts was developed at Toronto, Canada. In this the company makes a house-to-house canvass of the city, so that each home is reached three times a year. By this means every lamp in each residence is examined and adjusted and the glassware cleaned. There is no charge to the customer for this service. Where it is necessary to replace broken glassware, mantles or other broken parts the work is done then and there by the inspector, who carries a stock of renewal parts in a well equipped kit. These articles are supplied at regular prices without charging for the labor. The object of such a regular main-

tenance system is to anticipate complaints on the lighting equipment and to insure to the customers continued proper illumination throughout the house. Good results can be obtained at a relatively reasonable expense. The profit on the sale of lamps and lamp parts considerably reduces the cost of the service to the company. The inspector also takes care of complaint work, which otherwise would require sending out a special inspector.

A modified form of maintenance service is known as the Chicago plan; this is a selective plan. Those customers who signify their desire for this service sign a contract by which lamps are maintained at a certain rate per lamp per month. Each lamp is inspected and taken care of once each month, thereby being kept in perfect condition. No charge is made for renewals. The Bureau of Standards has shown in its investigations that gas-lighting equipment maintained by the customer is usually not maintained at all. The points brought out in Mr. Myers' paper, while especially important as regards gas-lighting equipment, are also deserving of attention by electric lighting companies.

NATIONAL ASSOCIATION OF STATIONARY ENGINEERS IN ANNUAL MEETING.

Papers and Addresses Trended Toward Educational Work.

The thirty-fifth annual convention of the National Association of Stationary Engineers was held at Evansville, Ind., September 10-14. The exhibits were displayed in the New Soldiers and Sailors Coliseum, and the business sessions were held in the hall of the Liederkranz Maennerchor. The attendance was large, 309 delegates having registered. Fourteen years ago the convention was held in this city, and its entertainment is still held in grateful remembrance by those who participated in it.

Monday was devoted to the official registration of officers, delegates and visitors at the Coliseum, and to escorting the delegates to the headquarters. In the afternoon the annual meeting of the National Exhibitors' Association was held, and in the evening the mechanical exposition was formally opened with appropriate exercises and speeches.

The opening session of the convention was held at the Memorial Coliseum, E. G. Heeger, chairman of the local committee, presiding. Promptly at 10 o'clock Tuesday morning the band struck up "America," which was sung by the entire standing assemblage. After an invocation by the Rev. William Dresel, Mayor Benjamin Bosse welcomed the delegates and visitors to Evansville in the absence of Governor Goodrich. This welcome was responded to by National President John A. Kerley and National Vice-president John A. Wickert. J. R. A. Hobson, chairman of the convention committee of the Chamber of Commerce, told of the growth and attractions of the city, and was responded to by Past National President Walter H. Damon. On Tuesday afternoon the first business session was held in Liederkranz Hall, and included a lecture by Eugene Graham on "How Manual Training Became Vocational Training." The Ladies' National Auxiliary and the Life and Accident Department also held their annual meetings.

Wednesday was manufacturers' and employers' day at the mechanical exposition. At the morning business session of the convention an interesting lecture was given on "The One Hundredth Anniversary of George Henry Corliss, the Inventor of the Corliss Engine," by H. F. Mueller, chief engineer of the Washburn-Crosby Mills, Minneapolis, Minn. The remainder of the session was taken up by a discussion on license legislation.

Thursday morning, September 13, was mainly devoted to a welfare talk by delegates on "Methods of Increasing Attendance at Association Meetings" and "Simple Cost-Keeping Systems for Isolated Plants." Charles H. Bromley made a strong appeal for better educational work. Every effort should be made to stimulate a continuation and a constant broadening of the work. The association now spends from 3 to 10 per cent., but should spend 50 per cent. of its funds. The speaker recommended a national educational bureau and said that a five-thousand-dollar man should be placed in charge of the bureau supplying educational needs. A new situation created by the war has got to be faced. He spoke of the success of moving-picture lectures by various speakers, especially by outside men, and the need of lessons in deportment, so that the engineer can present his case to the employer as man to man.

John F. Hurst talked on keeping costs in isolated plants. Simple record systems are needed in order that the wasting of resources may be avoided.

The following recommendations of the president were presented by the Resolutions Committee: That funds be appropriated from the national treasury for license legislation when every subassociation of state pledged support of national license committee to give aid deemed proper (passed); that an educational program be undertaken to fit members, collect and compile data of plant-operating costs to be available for any engineer threatened with central-station competition (passed); that future national conventions be held in central states in order to save on mileage and conserve the funds of the association, that the treasury should maintain a balance of at least $8000 (passed).

Business meetings were also held by the National Exhibitors' Association and by the National Ladies' Auxiliary. The Exhibitors' election of officers resulted as follows: Paul T. Payne, president; Charles Cullen, vice-president; Horace Smith, treasurer; Charles Wilhoft, Thomas Green, F. N. Chapman, L. W. Brooks and Frank Martin, executive committee.

At the concluding business session on Friday morning the following officers were elected: John A. Wickert, president; Roderick MacKay, vice-president; Fred Raven, secretary; S. B. Force, treasurer; W. J. Reynolds, national trustee; John F. Hurst, conductor; E. G. Heeger, doorkeeper. Cincinnati was chosen as the next convention city.

GOVERNMENT AND COPPER PRODUCERS AGREE ON PRICES.

Rate of 23.5 Cents per Pound Stipulated—Wages Not to be Decreased—Market Stabilized.

The most noteworthy event of the past week was the designation of 23.5 cents per pound as the Government's price of copper for the succeeding four months. This figure was fixed by agreement between the War Industries Board and the copper producers and dealers, which was approved by the President. The price specified is f. o. b. New York City, and will be subject to revision at the close of the four months' period.

The price agreement contains three conditions:

First, that operators of mines and smelters shall not reduce wages below those now being paid; second, that producers shall sell copper to the public and to our war allies at the same price that the Government pays; and that they will co-operate with the War Industries Board in such distribution of copper as will prevent its falling to hands of speculators who might increase the price to the public; third, that the operators pledge themselves to keep up the production of copper to the maximum capacity so long as the war shall continue.

Another provision is that the proper Government department will be asked to take over the mines and plants of any producers who fail to conform to the price fixed and other conditions.

It should be said that the copper companies, as a body, displayed an admirable spirit, and the price-fixing was arranged with due regard for the cost of production on one hand, and the requirements of the Government and public interests on the other.

The result probably will be to prevent accumulations for speculative purposes, to stabilize market conditions and to minimize labor disturbances. While wages are not to be reduced, there is no likelihood of their being increased above existing scales, which are based upon much higher-priced copper than the price now to prevail. It is a well-known fact in the copper mining industry that, for a number of years, wages have advanced with the price of copper, according to an accepted sliding scale, and have gone down with the copper price according to the same scale. Existing wages are based on this year's maximum price, and the adoption of 23.5 cents is virtually a scaling down of the price below a normal level, while leaving the wages as they were when copper prices were at their highest level. Hence, no wage increases are possible, even under the pressure of strikes.

The cost of copper production is a variable figure. It depends not only upon the grade of ore mined, but upon the other metallic contents of the ore. Some ores run low in copper and contain no other metals, in which case low cost of production depends upon handling a great tonnage by economical methods; other ores run high in copper and also carry silver, gold and lead in such amounts as to afford profits with all metals at their lowest price. The copper companies will adjust themselves as well as possible to the accepted price, and in most cases probably be able to operate at a fair profit, if undisturbed industrial conditions are maintained.

American Gear Manufacturers Hold Meeting in Chicago.

The American Gear Manufacturers' Association held its semiannual session in Chicago on September 13 to 15 at the Edgewater Beach Hotel. The association numbers among its members practically all of the prominent gear manufacturers in the country. The Chicago session was the largest of any yet convened. Special importance was attached to the present meeting because of the members' desire to effect as much standardization in gear products as possible, now that the war is making special demands upon all manufacturers and users of materials.

F. W. Sinram, of Van Dorn, Dutton & Company, Cleveland, O., president of the organization, opened the session on Friday morning. A paper on "Advertising Don'ts" was read by J. C. McQuiston, advertising manager of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. W. H. Phillips, of R. D. Nuttall Company, Pittsburgh, followed it with a talk on the "Heat Treating and Hardening of Gears."

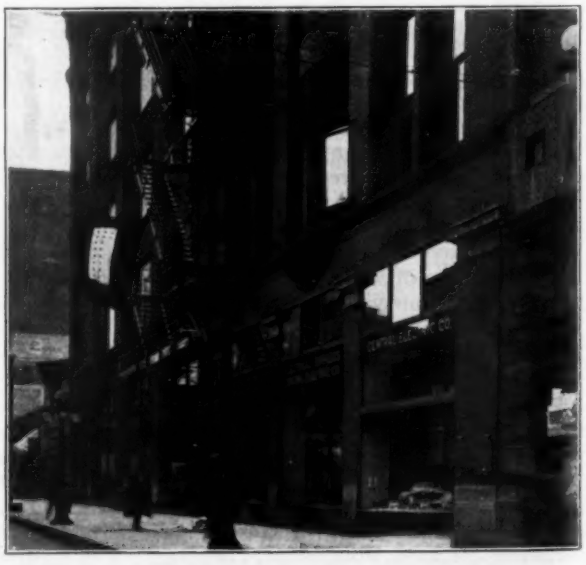
On Saturday a paper by B. S. Waterman, of the Brown & Sharpe Manufacturing Company, on "Inspection of Gearing," was read; also another by H. E. Eberhardt, of the Newark Gear Cutting Machine Company, on "Spur Gearing by the Rotary or Disk Cutting Process," and another by F. Schneider, of Van Dorn, Dutton & Company, Cleveland, on "Spur Gears by the Shaper Method." All papers read at the convention were very instructive and provoked much discussion.

FIRST OFFICIAL INDUSTRIAL FLAG UNFURLED IN CHICAGO.

Central Electric Flies a Flag of 18 Stars, Indicating 18 Men in Military Service.

Central Electric Company, 230 South 5th Avenue, Chicago, was the first industrial and utility institution in the city to unfurl an Industrial Flag, an emblem authorized by the Government for display by concerns which are co-operating with the Government or in any way responding to the national call for service in any capacity. The flag is made up of a red border, with a rectangular field of white in the center. On the white field are a number of stars in blue, indicating the number of men of this company and its employees who have entered the military and naval service in the war in which our country is engaged. Central Electric Company's flag has 18 blue stars emblazoned on its white field. It was seen floating in the breeze from the front of the company's building on Monday morning of this week, and attracted much favorable attention. Most of this company's 18 men in service entered as volunteers.

The Central Electric Company, officials and employes, from top to bottom, have taken a pronounced attitude of loyalty, expressed in hearty response to calls of the Government. This has been shown in the



Government Industrial Flag of Central Electric Company, Indicating 18 Men in Government Service.

liberty bond purchases, Red Cross contributions and personal service in the war.

Other concerns probably will follow with a display of similar flags.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

Cooking Campaign Results in Large Increase in Electric Energy Output at Stockton.

The electric heating and cooking campaign conducted by the Stockton, Cal., division of the Western States Gas & Electric Company has resulted in the addition of more than 453 kilowatts to Stockton's energy output. More than 50 electric ranges have been sold, 41 water heaters and 18 air heaters. New business recently closed by the company includes also 150 horsepower additional for the Samson Sieve-Grip Tractor Company and 60 horsepower additional for the State Hospital. The company is negotiating with the Union Ice Company for the electric energy requirements of its new refrigeration and cold-storage plant, amounting to about 200 horsepower in motors. Stockton's new city directory fixes its population at 48,008, which is an increase of 3288 over last year.

Electric Vehicles Extensively Used In Postal Service.

Electric trucks are being used very successfully by the Post Office Department in several large cities. St. Louis has had a fleet of electric trucks in its postal service for more than six years which have given splendid service even under the most severe weather conditions. These trucks are in service from 5:45 a. m. to 11:30 p. m. and average 30 miles each day.

The postal service in Boston uses 15 electric trucks which are operated on the "battery-service" plan. These "electrics" make runs of 25 miles each day, and have made substantial savings as well as greater efficiency in handling the mail.

The largest electric postal fleet in this country is probably that of the New York Postal Transfer Service which operate 47 "electrics." These trucks have been in service for three years, and are on duty for two ten-hour periods each day. The dependable, simply-operated electric truck has been found almost indispensable in this service which requires the speedy and safe negotiation of congested traffic.

Can Only Find Electric Irons in Amarillo.

This sound like a fairy tale, yet it comes from W. B. McSpadden, new-business manager of the City Light & Water Company of Amarillo, Tex.:

"There are no old fashioned irons for sale in the city of Amarillo. This fact became known when, while in conversation with one of the ladies who is in charge of the local Red Cross work, Guy W. Faller (general manager of the company) was informed that the Red Cross ladies had been to every hardware store, furniture store, and every other place of business which should handle flat irons, and none of them had an old fashioned iron in stock. In several instances the ladies were told that the demand for electric irons had grown so great that there was very little sale for the ordinary flat-iron, so they did not carry a stock of them.

"Mr. Faller offered the ladies the use of as many electric irons as they needed which they accepted with pleasure, and now the Red Cross workers are also boosters for the electric iron."

CHILDREN OF FRANCE TO BE REMEMBERED ON CHRISTMAS.

A Plan Inaugurated in Indianapolis That May Become Nation Wide.

The Merchants' Heat & Light Company, Indianapolis, Ind., is taking an active interest in the plan of raising a fund with which to procure and send 20,000 packages to France at Christmas time for distribution among children of that country, as presents to them from Indianapolis. This plan originated with the local unit of American Fund for French Wounded, at Indianapolis, and is being taken up elsewhere as the "Indianapolis Idea." The movement, begun thus early, is one in which the many may help without undue sacrifice, and the thousands of children of France who are bereft and in want present an appeal to the sympathies of Americans worthy of a generous response. Many of their fathers were on the firing line in defense of their country and are now among the wounded and slain.

Window Display of Merchants Heat & Light Company in the Interest of French Christmas Fund for the Wounded.

The fund-raising campaign in Indianapolis is being helped along in many ways, and one of the most effective of these is that adopted by Merchants' Heat and Light Company, which has set apart one of its show windows for a display calculated to arouse interest in the plan and create sympathy for French chil-

dren. In this display window there is represented an American Christmas tree loaded with presents, and by the side of it a Christmas tree in France marked, "Somewhere in France—Will We Leave This Tree Bare." Other expressive inscriptions of similar intent are presented. Children are deeply interested in the movement and are responding with presents. It is anticipated that the plan will become one of nation-wide adoption.

Terre Haute Company Secures Electric-Furnace Contract.

The Terre Haute, Indianapolis & Eastern Traction Company has closed a contract for electricity with the Midland Electric Steel Company, of Terre Haute, Ind., for the operation early in October of a 1200-kilovolt-ampere, three-ton capacity, two-phase, Booth-Hall electric steel furnace, capable of turning out 30 tons of steel per 24 hours, melting and refining cold scrap.

The plant will be located at Terre Haute, Ind., in connection with the Highland Iron & Steel Company, an arrangement having been made for the latter company to roll the product, which will be forging billets four inches square and under.

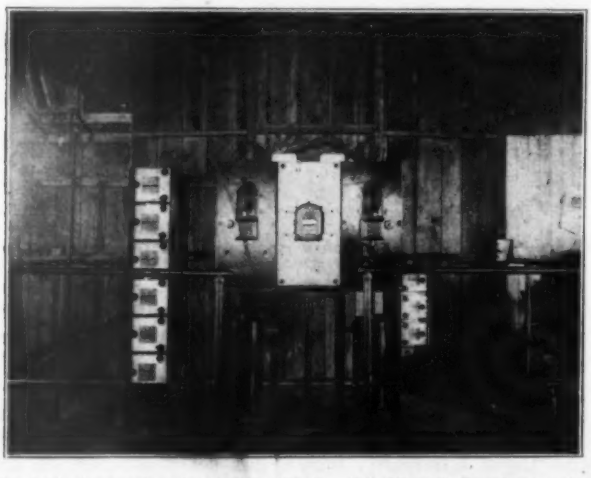
Joseph B. Moos, Chicago, is president of the Midland Electric Steel Company, which has been just recently incorporated.

Flood Lighting Flower Beds a New Application.

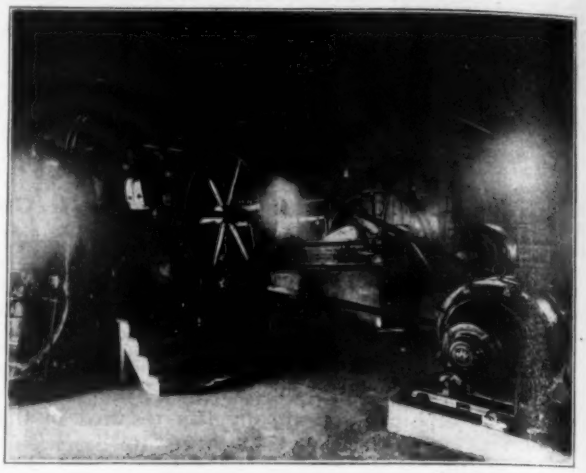
The Empire District Electric Company, Joplin, Mo., has found a novel use for flood lights. It uses them to light flower beds at night. The Independent Candy Company and the McNeal Machinery Company of Joplin decided that the flower beds in front of their plants were too pretty to be invisible at night, so they arranged with the Empire company for the installation of a flood-light system around the flowers, and now they are as attractive by night as by day. C. L. Proctor, new-business manager of the Empire District Electric Company, says that to the best of his knowledge, this is the first time that flood lights have been put to such use.

Electric Power Serves Joliet Pumping Plant.

The city of Joliet, Ill., draws its water supply from wells sunk at seven different places. Pumping plants at each feed a central plant which maintains the pressure in the mains and provides higher pressure in case of fire.



Control Apparatus in Joliet Plant. Oil Circuit-Breakers with Overload Trip, and Watt-Hour Meter Mounted on Panels. Below Controllers For Motors.



Foreground: Triplex Pump. Background: Air Compressor.

At the Ruby Street station a frame building houses equipment whose capacity is 1,500,000 gallons per day. An Ingersoll-Rand compressor, 17 inches by 10 inches by 16 inches belted to a Westinghouse 100-horsepower, 690 revolutions per minute wound-rotor induction motor, furnishes air to lift the water to the surface, after which it is forced into the pipe lines by a Goulds triplex plunger-pump belted to a 175-horsepower Westinghouse motor of the same type. Power is furnished at 2400 volts, three phase, 60 cycles.

This plant has been in operation for about seven months. Its only shutdowns have been for one hour daily for oiling.

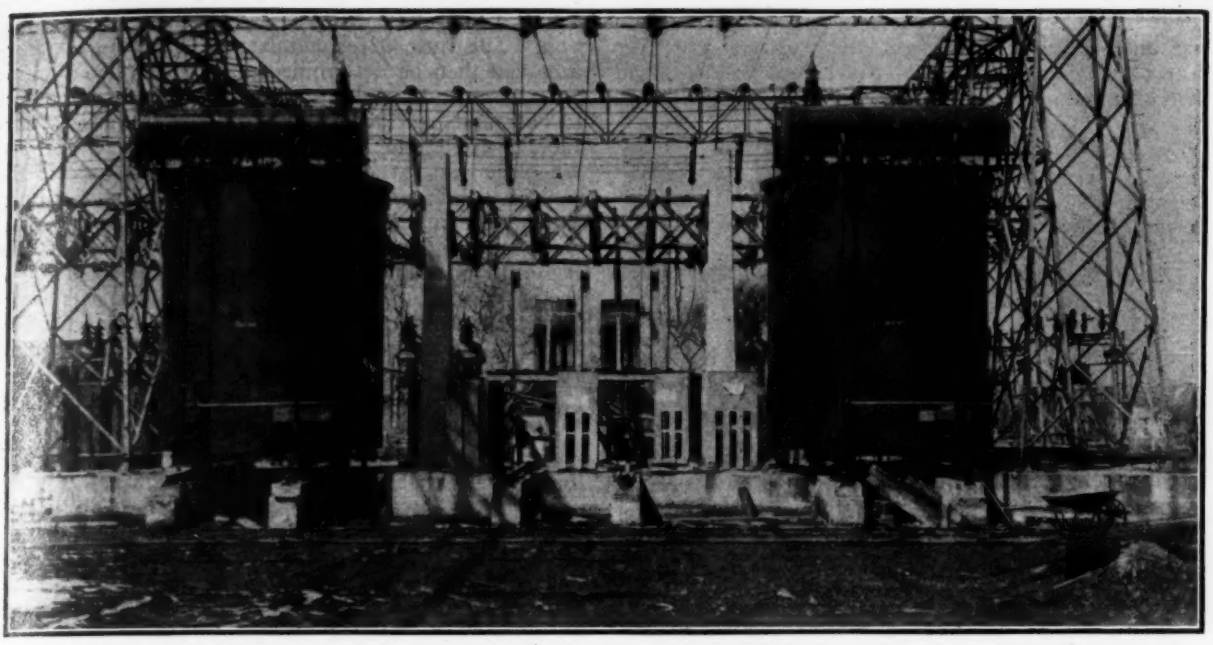
Electric Power Sales at Norman, Oklahoma.

Since February 1, the date on which the Norman division of the Oklahoma Gas & Electric Company was taken over by the Oklahoma Gas & Electric Company for operation, a large amount of new business has been secured under the management of W. P. Jones. Following is a report of new business secured by the Norman division between February 1 and September 1:

Net gain in lighting customers—92 with 21 kilowatts lighting capacity; net gain in power customers—seven with 68½ horsepower; two additional power installations in cotton gins amounting to 150 horsepower; net gain in sign meters set—two with 200 five-watt lamp equivalents; 132 household appliances, including seven electric ranges, 91 6-pound irons, seven grills, one El Cooko, 19 desk fans, four ceiling fans, two washing machines, one sewing machine motor.

Louisville Appliance Campaign Progressing.

The appliance sales campaign of the Louisville (Ky.) Gas & Electric Company in connection with the appliance dealers of the city is progressing in a most satisfactory way. The salesmen of the company, who are working on flat salaries with commissions on their sales, are finding sales readily made and many of them are making money at a rate they never exceeded heretofore. In fact, the returns are so satisfactory to many of the men that they are taking a good deal of their own time in the evenings to continue their efforts. The three-cent rate on excess consumption is appealing with special force to the domestic consumers of the city.



Notes on Operating Practice

A Department Devoted to Practical Problems of Plant and Operating Practice With Particular Reference to Electrical Generation and Distribution

LOUISVILLE COMPANY OPERATES COAL MINE.

Continuous Coal Supply Insured—New Unit Added to Waterside Plant.

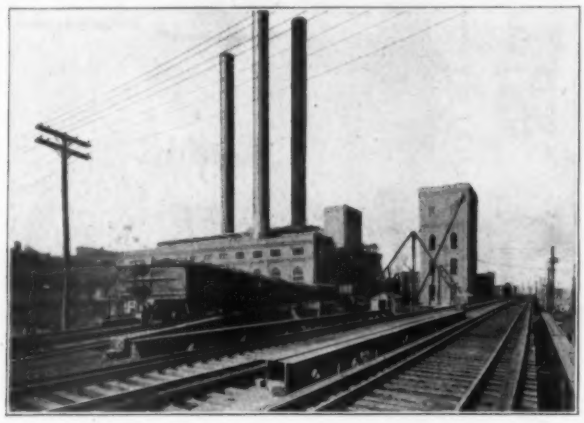
Within a few days the Louisville (Ky.) Gas & Electric Company will be in position to rely altogether on its own coal mines for fuel to operate the big Waterside station, on the bank of the Ohio River between Second and Third Streets. For several weeks the company has been getting a portion of its coal from these mines and is now virtually independent of conditions which must be met by other industrial consumers which buy their fuel at the market. During the last several months the Louisville Gas & Electric Company has been having more or less difficulty—less than most companies located further from the supply of coal—in keeping a supply of coal on hand sufficient to insure operation of the plant. This difficulty and the prospects of strenuous times in the coal market during the coming winter and perhaps for some years in the future led Donald McDonald, general manager and vice-president of the company, to recommend the program of acquiring mines which has now been worked out.

The plant of the Louisville company is designed to burn a non-coking coal which is produced in the western Kentucky field and which is cheaper than the coal from the eastern Kentucky field and that in similar veins. Accordingly, at the nearest point to Louisville at which coal could be mined on a railroad the Louisville Gas & Electric Company leased a tract of coal land. This is at Render, where a mine was formerly operated by an individual operator. The mining town was already built and slope, instead of shaft mining was possible. Render is in the south central part of Ohio County, on the Illinois Central Railroad, and the haul to the coal bins of the Louisville Gas & Electric Company, also served by the Illinois Central Railroad, is just 110 miles. The electric company bought a number of large steel hopper railroad coal cars and has a contract with the railroad company for hauling them back and forth between the mine and Louisville.

The property was acquired in the middle of July and since that time work in developing the operations has been pushed forward on continuous shifts. Two openings were made and both are now producing coal, which is from what is known in the coal industry as No. 9 seam. It is about four feet eight inches thick and is of the precise quality and character that the furnaces of the company in Louisville were designed to burn. The mines are not elaborate and are hand mines, using mules to draw the cars out of the entrances to the railroad loading tipple. At this time about 100 men are employed. Machinery for mining will likely be added as the circumstances require. All the coal is handled without selection as mine-run and is dumped from the company's own cars on a switch on an elevated trestle directly into the hoppers of the power plant, whence it is fed by gravity into the furnaces, automatically stoked. Before being burned, however, it passes through the crusher which reduces the lumps to the proper size for the furnaces.

Equipment of the new 18,750-kilovolt-ampere unit which the company has been adding to its Waterside plant is now in operation and has been run satisfac-

torily for all the tests, although not as yet put into use on commercial service. This will wait until the water is applied for condensing, which will be obtained from the bed of the Ohio River in a newly constructed



View of Louisville Waterside Plant From Coal-Receiving Tracks

tunnel. The new work includes a new battery of boilers and a third steel smoke stack. This additional unit will bring the rated capacity of the Waterside plant up to 40,750 kilovolt-amperes. All will be available for commercial service in another month. Lewis J. Strang, general superintendent of the company, has directed the improvements.

STEAM ECONOMIZERS AND MOTOR-DRIVE VERSUS STEAM-DRIVE AUXILIARIES FOR SMALL PLANTS.

By I. L. Kentish-Rankin,
Commonwealth Edison Company, Chicago.

While the economizer is considered a necessary adjunct to small as well as large steam-making plants in Europe its use has been chiefly confined to the larger plants in this country. This is a pity, though times are changing rapidly, due in no small measure to the high cost of fuel, the recognition of the gross extravagance often existing, etc.

An economizer is usually installed to effect fuel economy by utilizing heat that otherwise would pass up the stack. Sometimes, however, it is installed because it increases the steam-making capacity of the boiler, thus saving the installation of another boiler. Speaking generally, the higher the steam pressure the more efficient will an economizer be and the lower the efficiency of the boiler because the average temperature difference between furnace gases and the boiler contents becomes less with increasing pressures. Also the higher the rate of evaporation of a boiler the greater the velocity of the furnace gases and the higher their temperature as they pass into the stack, hence the economizer finds a greater need where the rates of evaporation are high.

Usually it is best perhaps for the small station not to install an economizer. With the small as with the large plant, however, decision can be made only after analysis of the situation under several conditions of operation. The factors involved are: cost of coal, rates of evaporation and periods of each where variable, relative heating surface of furnace and boiler, temperature of flue gases, temperature of feed water. With these data, it is possible to determine how much heat at present wasted is available for utilization. The ratio of economizer to boiler-heating surface can then be determined, or rather various ratios are chosen, and each carefully analyzed with respect to cost and heat absorption per foot of heating surface. Strictly, the cost of an economizer is justified when the heat saved by its heating surface exceeds the cost of installation as represented by the interest upon the investment and maintenance charges. In actual fact several other factors ought to be considered, some being placed to the credit and some to the debit side of the account. For example, the economizer acts somewhat as a water purifier, thus reducing those troubles that come from scale and possible overheating, while the lesser scale formation which acts as a partial heat insulator upon the heating surface permits less frequent cleaning. The economizer increases the steam-making capacity of a boiler, and at lower cost than were additional boiler heating surface employed, for economizer heating surface is considerably lower in cost than that of the boiler, thus conveniently permitting heavier loads of short periods to be carried economically. The chief item on the debit side of the account is that natural draft must usually give place to mechanical because the natural draft is very much reduced by the economizer, due to the abstraction of heat from the flue gases; likewise the resistance offered by the economizer tubes must be overcome, a rather high resistance when the tubes are dirty and covered with soot. Mechanical draft requires a continual expense for driving the motor or steam engine, and for maintenance of both prime mover and blower. On the other hand, the use of induced draft with an economizer has the advantage that the boiler may be forced very considerably in the majority of cases, though each case must be governed upon its own merits. In installing an economizer, whether one economizer is used for each boiler or one for the two boilers may play a large part in the results obtained, for each arrangement has its advantages and disadvantages.

Choice of Auxiliaries

The question of choice of motor or steam-driven auxiliaries is a very important one, often given far less consideration than it warrants. Here again the matter should be considered from the viewpoint of economy of fuel, reliability to service, floor space, flexibility of control. Reliability of operation is more difficult of solution in the small than the large plant. In the large station many of the auxiliaries may be both steam and motor driven, so that should the steam pressure be low the motors can be used; should the electrical end be shut down or in trouble steam is resorted to. Moreover, by the judicious use of alternating-current apparatus and direct-current apparatus operating from the exciter and battery buses, a shut down of the electrically driven auxiliaries is safeguarded against. Another advantage of these combined steam-electric driven auxiliaries, apart from offering a guarantee against failure of the steam or electrical ends of the system, is that they permit of very economical operation which reacts directly upon the coal pile. For example, with fluctuating loads the combined electric-steam drive permits of electricity being used at light loads and the steam drive at heavier loads when the exhaust steam is needed for the feed-water heater.

In the smaller plants steam drive for auxiliaries so often means heat wasted from leaky valves and traps and flanges, poor insulation of pipes all chargeable to

lack of care and all cumulative in adding to the fuel bill. These effects of deterioration are absent with electric drive as is also the complicated and not entirely safe live-steam piping system.

Another matter. The economizer can very often be used to good advantage with exhaust-steam feed-water heaters, thus permitting the use of exhaust-steam auxiliaries with the resulting economies due the economizer. Where the exhaust-steam feed-water heater is used alone the feed-water heater can never be raised above 212 degrees Fahrenheit at atmospheric pressure, and usually considerably below this figure, however much exhaust steam is available, whereas the economizer will probably heat the exhaust higher.

The high cost of coal demands careful consideration of the economizer, as does also the higher steam pressures, greater water evaporation per unit of heating surface coming into vogue. Steam costs money and none should be wasted. While the electrically driven auxiliaries are certainly far superior to the old-style steam-driven units, the modern steam turbine and reducing gear now marketed in very small capacities opens up a new field for exhaust-steam auxiliaries with feed-water heaters or with the economizer and feed-water heater in some instances.

INEXPENSIVE INSTALLATION FOR FARMERS' LOCAL POWER LINES.

Farmers Form Local Lighting Company to Distribute Hydroelectric Power Over Their Own Lines.

To supply electric light and power to scattered farms requires satisfactory solution of two problems. One is economical and yet fairly reliable line construction. Another is the financing of the distributing system. A happy solution has been found in a little Wisconsin community.

The first of the rural light and power companies to receive current from the hydroelectric plant at Prairie du Sac, Wis., started operation on September 11. This large power plant, operated by the Wisconsin River Power Company, now one of the Insull properties, was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of May 19, 1917. The rural company in question is known as the Sumpter Light Company. It is composed of some 25 prosperous farmers who financed it and built their own transmission line. Several other companies of a like nature have been formed, which will take current from substations along inter-city lines now being built.

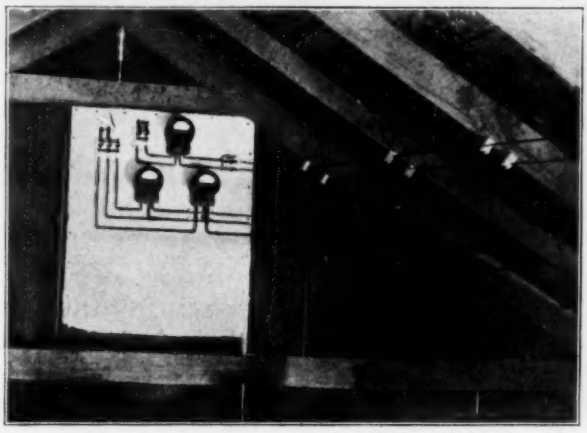


Fig. 3.—Service, Cutout and Meter Board in Farm Building.

The house wiring and all connections from the transformers was done by a local contractor, L. C. Stoddard. The illustrations herewith show some examples of this wiring. Fig. 1 is a view of the pole line with typical transformer installation where lighting service alone is to be furnished.

At the farm of Elsing Brothers, where light and power both are to be furnished, there are two five-kilowatt General Electric single-phase transformers installed in open delta, as shown in Fig. 2, with primaries connected for 6600 volts. Three-phase, 250-volt current for power is taken off from the two secondaries, while single-phase, 110-volt current for lighting is taken from one-half the secondary of one of the transformers.

Fig. 3 is a view of the service, meter and cutout board for the Elsing farm; it is located in the loft of the granary. A Duncan 25-ampere, 250-volt, 60-cycle, polyphase model M2 meter measures the energy in the power circuit, while a model M2 single-phase, 110-volt meter is connected to the lighting circuit.

As before mentioned, the farmers built their own line and bought the materials. The main line is of No. 4 galvanized iron wire and the laterals are of No. 6 galvanized iron wire.

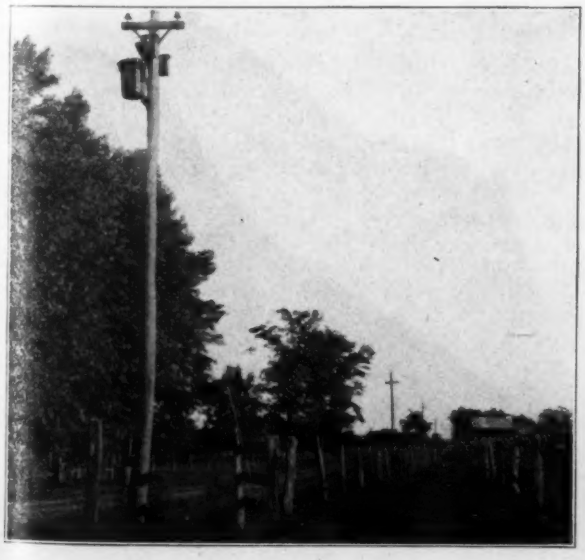


Fig. 1.—Farmers' Iron-Wire Line With Lighting Transformer.

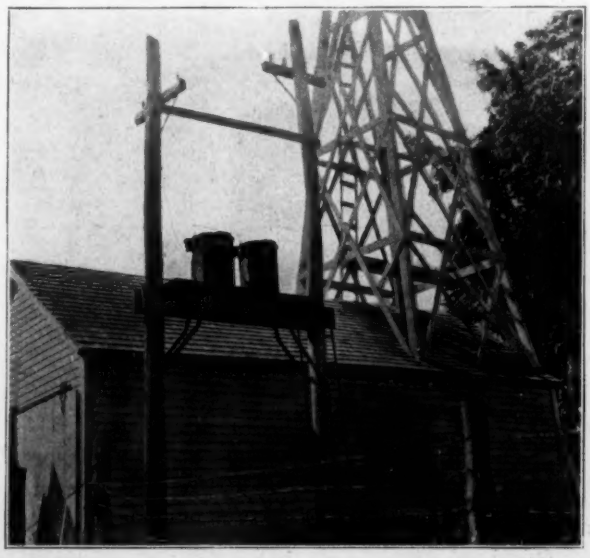


Fig. 2.—Bank of Two Open-Delta-Connected Transformers.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

UNDERWRITERS' LABORATORIES SERVICE FOR RIGID CONDUIT.

Improvement in Zinc Coating Through Regular Factory Inspection and Test Service.

The curves shown in the accompanying chart are illustrative of a feature of the factory inspection and label service of Underwriters' Laboratories of which many who do not make use of labels regularly are not informed. Many property owners, architects, contractors and inspectors know of the Underwriters' label only as a means of identification of goods which have been examined and tested at factories and found to be standard. While this is the principal as well as the original function of the label, the service delivered by Underwriters' Laboratories is, wherever possible, planned to secure results in many ways of benefit to the users of labeled material as well as to the manufacturers of appliances and materials.

In the electrical field in particular this service feature has seen great development. This is largely due to the splendid co-operation extended to the Laboratories by the manufacturers, acting individually and as a body in each branch of the industry and through the Associated Manufacturers of Electrical Supplies. The curves demonstrate this service feature for rigid conduit.

The efficiency of the zinc coatings on conduits in protecting the steel tube from corrosion is of course dependent upon the thickness of the coating and its uniformity. In the label service procedure for this product it is provided that, in addition to the tests made by inspectors at the factories, specimens representative of the daily output shall be taken by the inspector and forwarded to the Laboratories' main testing station in Chicago. These specimens are promptly subjected to quantitative analyses for amount of zinc in the coating and for uniformity in thickness. The results of these tests are immediately reported to the manufacturer with the history of the specimen. Study of these reports permits of necessary modification of factory methods to avoid excessive variation as well as substandard product. Persistent attention to metallic-coating-machine operation based on such accurate data makes possible astonishing improvements in the course of time.

Curve *A* shows the variation from day to day in amount of zinc in the coatings of specimens from one particular factory's output during 1914. There are a number of points in this curve which show that coatings for these specimens were very thin. Other specimens had excessive amounts. Curve *B* is the 1915 record for the same factory. While wide variations in amounts of zinc in the coating appear, it may be seen that a minimum amount of one-quarter ounce per square foot is exceeded.

The 1916 record, curve *C*, fully demonstrates the manufacturer's success in securing control of the process as the result of intelligent study of the reports regularly received from the Laboratories. It is of further interest that the total quantity of zinc used for the output for 1916 is only slightly, if at all, in excess of the amount used in the previous years while the service value to the user, especially from the point of view of resistance to corrosion, is materially increased.

The case cited is typical of a great many instances of highly beneficial results from co-operation between Underwriters' Laboratories and manufacturers subscribing to the service of inspections at factories and labeling. The very high standard maintained in this service has stamped as being superior all products to which it is extended. Mutual advantages result therefrom to both users and manufacturers of these products, and the community at large is also benefited through the practical elimination of hazards from the use of labeled goods.

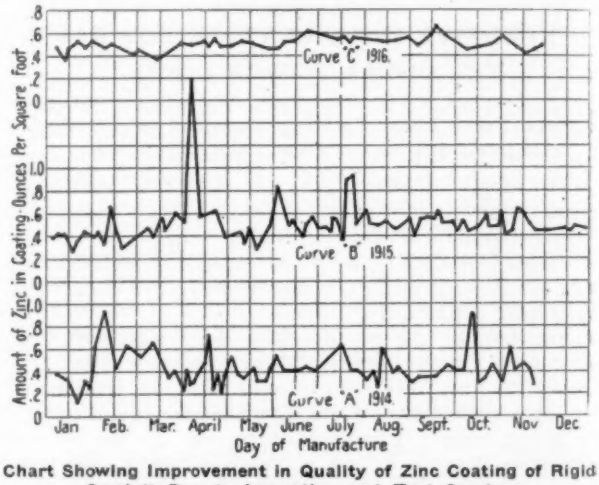

Curve "C" 1916.
Curve "B" 1915.
Curve "A" 1914.
Amount of Zinc in Coating Ounces Per Square Foot
Jan Feb Mar. April May June July Aug. Sept. Oct. Nov Dec
Day of Manufacture

Chart Showing Improvement in Quality of Zinc Coating of Rigid Conduit Due to Inspection and Test Service.

Soldering Joints in Large Wires.—In soldering joints in wires of large size trouble is often experienced by the electrician, due to the solder not taking a firm hold of the surfaces to be joined. Many reasons are given for this; sometimes the flux is thought to be at fault, or the solder itself. I find from experience that careless cleaning of the surface is frequently the trouble. The following directions I have found to give the best results. First clean the wire the required length by means of a stiff wire brush, or knife if no such brush is at hand. Then put on the soldering paste and dip the wire ends into the soldering pot slowly. This gives the wire a good tinning. If the wires are very large a slight bend near the ends will allow dipping them into solder more easily. After the wire has cooled off make the joint in the usual way, tightening it as securely as possible. Then put on a little more soldering paste and solder the joint by holding the ladle as near to it as possible and pouring solder over the joint slowly. A. GEMMELL.

Co-operation in Modern Home and Apartment-House Wiring Practice

Strong Report Recommends Hearty Co-operation Between Contractors, Central Stations and Architects to Secure More Complete House Wiring, Switches and Convenience Outlets for Electrical Appliances

THE tremendous increase in the use of all manner of household electrical devices from the flatiron to the electric range has brought forcibly to our attention the crying need of better home and apartment-house wiring practice and the necessity of closer co-operation between the architect, the building contractor, the wiring contractor and the central stations to the end that new homes and apartment buildings have adequate facilities not only for lighting, but also for lamp-socket devices, ranges and water heaters.

After a careful canvass of the situation in the territory comprising this Association we are of the opinion that no definite program for co-operation to this end has been carried on by any member company of this Association. Most of the member companies are alive to the fact that something must be done to hold up residence and apartment-house earnings, and many companies are making strenuous efforts to place current-consuming devices on their lines. All are daily confronted with the fact that the average home does not have sufficient convenience outlets to which may be connected lamp-socket devices, and nearly all report the loss of sales because of the difficulty of attaching appliances to overhead fixtures.

The Problem in a Nutshell.

The problem then is to see that circuits and outlets are provided for table lamps, appliances, ranges and water heaters, as well as ample lighting circuits and switches in the already built home, but more particularly in the homes and apartment houses of the future, because the latter class can be reached while yet on paper or under construction.

At no time in the history of our industry has the opportunity for closer co-operation between the central stations, architects and contractors been so good as now. This is rightly called "The Age of Co-operation."

Improved Status of Electrical Contracting Business.

Thanks to the splendid work of the national and state contractors' associations, assisted at times by the central stations and jobbers, the status of the electrical contracting business is rapidly changing from that of a competition-ridden, mismanaged business to one of excellent business methods, clean competition and fair profits. The electrical contractor has in many instances been quicker to see the value of co-operation with the central station than the central station has been to avail itself of the contractor's assistance.

Already-built-house wiring campaigns conducted jointly by the central stations and the contractors have done much to bring the two closer and have proven that the contractor can and will co-operate if given the opportunity.

It is not the purpose of this paper to offer a definite plan for co-operation with the contractors, architects and owners, although such a plan will be discussed in a supplementary paper* by a member of our committee. Here we will offer some suggestions which may be adopted and which we hope will bring out much valuable discussion.

Progress in the Co-operative Movement.

Co-operation in house wiring has long been advocated by electrical contractors. Probably never, however, has so clear a stand for co-operative effort been taken by central-station representatives as in a committee report on this subject presented at the recent Spokane convention of the Northwest Electric Light and Power Association. The report of this committee, composed of A. C. McMicken, chairman, H. H. Schoolfield, F. H. Murphy, Foster Russell and L. R. Grant, was submitted at a joint meeting with the Washington Association of Electrical Contractors and Dealers.

The first portion of this report is reprinted herewith. Other portions will be published in following issues. The report contains much valuable material for electrical contractors as well as central stations. In the Northwest, especially in Washington and Oregon, co-operation has been carried further than in other sections of the country. Developments in electric range cooking and water heating have also been more advanced. A study of the matter is therefore recommended to all electrical contractors.

Must Prepare for Increasing Use of Electrical Household Appliances.

As before suggested, the steady increase in the efficiency of incandescent lamps and the constant revision downward of lighting rates is seriously affecting residence earnings and the problem of keeping these earnings up is not solely one of selling current-consuming devices, but includes providing facilities for using them conveniently and safely.

We should be looking ahead, not one year or two years, but ten years, and endeavor to picture conditions in the future. Begin now to prepare for changes which are bound to come at least insofar as they will affect the use of electricity in the home.

During the past ten years the more common lamp-socket devices have sprung into being and have become well established, and now the vacuum cleaner, washing machine and electric range and water heater are becoming recognized as practical household necessities. The electric range is not yet universally established and accepted—not because it is not a splendid cooking medium, but because we have not all gotten behind it, and because we have not yet had time to educate our consumers to its many advantages.

*This paper, by Foster Russell, will be published in the next issue.

The day of the electric range is fast approaching, as also is the day of every other electric household labor-saving device. Fuel, whether it be oil, coal, wood or gas may be expected to increase in price as time goes by. This is our opportunity. Are we preparing for it?

How the Architect Looks at It.

In order to arrive at some definite idea for co-operation, sets of questions were sent to architects, building contractors, wiring contractors and central stations. From the answers to these questions it is apparent that the architects consider that they are specifying ample circuits for lamp-socket devices and the like, but are not yet convinced that circuits for ranges and water heaters are necessary; and it is further apparent that but a small percentage of homes are built under the architect's supervision.

Some one has said, "You can't tell an architect anything." Have you a wide acquaintance among the architects in your territory? Do you know a class of men any quicker to adopt improved methods and practices? Perhaps the reason you do not get full co-operation from architects is due to your method of approach.

Must Educate Builders and Owners.

Building contractors and home-building companies and associations who build homes for sale costing from $4000 up provide a fair amount of convenience circuits and outlets, but need to be educated to greater effort. The vast majority of houses built without architects' supervision, whether for sale or for the owner, do not have sufficient convenience circuits and outlets and in many instances do not have ample lighting circuits and switch control. This is largely due to houses being built for a lump sum, and in order to keep within the figure, the wiring, as well as other items, is cut down.

Both building and wiring contractors report that they have difficulty in convincing the owner of the desirability of convenience circuits and outlets except for certain appliances, such as an iron outlet in the kitchen. In most instances the matter is given little consideration by either the building contractor or the owner.

The contractors suggest that suitable literature setting forth the desirability, convenience and utility of convenience circuits and outlets sent the owner or prospective home builder when plans are being made or at the time building permits are taken out would greatly assist them in having such circuits installed. They suggest that this should be the function of the central station.

How Co-operation of Electrical Contractors Is to Be Secured.

It is well to state here that we cannot expect to have the co-operation of the wiring contractors if we are to compete with them in their field. Electrical contracting is a legitimate and specialized business, and one in which the central stations should not engage unless the community served is too small to support a local wiring contractor. Some central-station managers still consider the contractors fair-weather friends, and make no effort to really get acquainted and find out that the average contractor is a regular fellow after all.

It has been proven that the wiring contractor can be of great assistance in inducing the owner, architect and building contractor to make provision for range and appliance circuits and outlets. In many instances the contractor also sells appliances and is therefore doubly interested in seeing ample convenience circuits and outlets installed.

Houses and apartment houses built for sale or rent will not do either, unless wired for electricity and the demand for convenience circuits and outlets is increasing. A woman used to electric light and appliances, when house hunting invariably notices whether the switches are conveniently located and whether convenience receptacles are provided. Many already built houses have been wired solely because the occupant wanted to use an iron or other device.

Salesmen for one of the large home-building concerns carefully call the attention of prospective buyers to the ample and conveniently located switches provided and also to the baseboard, wall or floor receptacles in every room for the vacuum cleaner, piano, lamp, etc. They know it helps to sell the property.

The fact that practically every house and apartment building erected in the last four or five years in the Pacific Northwest was wired at the time for electric light does not mean we need not bring to the attention of the builder and owner the desirability for a better standard of wiring and illumination.

A home or an apartment house is not built to last a year or so, but to last a lifetime. Why not wire it now so that electricity may be conveniently and safely used to operate anything from an iron to an electric range? The owner may not contemplate installing an electric dishwashing machine in the kitchen at present, or a washing machine in the laundry, but he will have both some day and the outlets should be provided while the house is still on paper and the outlets can be added with the least additional expense.

Reports from member companies indicate that no regular follow-up of building permits is made except to secure contracts for electric service or to sell appliances, ranges and the like, and that these calls are not usually made until the house is practically ready for occupancy.

It is very apparent after studying the replies from the architects, building contractors, wiring contractors and central stations, that no concerted effort is made to increase convenience circuits and outlets in new houses and apartment buildings, and that the burden of securing organized co-operation rests with the central stations. We must all appreciate that the reason any convenience circuits and outlets are provided now is not because of concerted effort on the part of the local electrical interests, but because of the popularity of the appliances themselves, which has largely been created by national and local advertising.

Suggestions for Co-operative Work.

The following suggestions are therefore made to member companies:

Get acquainted with and seek the co-operation of the electrical contractors in your city or town. Go out of your way to help them and they will be more than glad to reciprocate. If the electrical contractors have a live association, your problem is greatly simplified and their assistance backed by their association can be secured and will be of great value. If the electrical contractors in your town do not have an association or do not belong to the state association, urge the latter to get them in. If this cannot be done, you can at least get them together and work out a mutual co-operative plan in your city or town.

Have your salesmen keep in touch with the wiring contractor. Many times after the wiring contract is let, co-operation of the contractor with a central-station salesman has resulted in additional wiring. The electrical contractor and the central-station salesman by good team work can influence the owner, building contractor and architect.

Make it a point to get acquainted with the successful building contractors in your territory. They are all intelligent men and can be convinced that convenience circuits and outlets add to the value of the houses they build and are one of the best talking points in making a sale of the property.

Every central-station salesman should know more than the rudiments of illuminating engineering and good wiring practice and should be able at all times to make pertinent suggestions to the contractor and the home builder, which, if adopted, will provide good illumination and for the convenient use of current-consuming devices.

Most important of all, you should endeavor to see every home owner as soon as you have information that he is about to build. Every man and woman building a home wants to include in it every convenience and comfort that their means will permit. Much time and consideration are given to planning the new home, but in the majority of cases the matter of electrical wiring is not understood or is not given the consideration it warrants, and when the home is completed regret is often expressed because convenience outlets were not installed for the vacuum cleaner, percolator and other devices, and the home builder cannot understand why the fixtures and glassware which looked so well when purchased proved so disappointing when installed. The interiors of many otherwise beautiful homes are marred by fixtures improperly located, inharmonious in appearance and improperly equipped with glassware.

We believe that suggestions for convenience circuits and outlets properly made to the home builder will be gratefully received, and that this should be as much the duty of every salesman as to secure the lighting contract. If you cannot have a competent salesman call and present arguments for better lighting and convenience outlets, send suitable literature, or, better still, send the literature and follow it up by a call from the salesman.

The N. E. L. A. Publication Committee has recently issued a handsome illustrated booklet with this purpose in mind and these can be purchased in any quantity for distribution in your territory. Architects, contractors and builders can use them advantageously, and the central station can mail them to the owner with a suitably worded letter offering the services of the illuminating engineer or the man in the organization capable of doing this work.

If you feel that the expense of purchasing or having printed suitable literature of this character is too great, it is at least possible for every central station to prepare a letter setting forth concrete reasons for convenience circuits in the home and designed to create a desire for electric labor-saving devices, which can be mailed at small expense.

We believe that the larger central stations can well afford to employ an illuminating engineer, who can make himself invaluable to the architect, contractor and owner by preparing wiring plans and specifications and making suggestions as to the color of walls, ceilings and draperies best adapted to the lighting effects desired, with due consideration for the type and class of fixtures and glassware to be used.

The illuminating engineer will also instruct and assist the salesman along illuminating engineering lines, which, by the way, is not confined to the proper design and location of lighting installations only, but applies equally as well to making provisions for current-consuming devices and motor loads.

After all is said, the man who pays the bills is the man who must be convinced. Co-operate with the architects, the building and wiring contractors, but above all bring your heavy artillery to bear on the home builder and owner. He will spend the money for comforts and conveniences for his loved ones if you can convince him that electricity will lighten their household tasks and make life more enjoyable.

Bushing for Conduit Risers in Reinforced-Concrete Buildings.

By Robert Oster.

If provision has not been made during the design and construction of a reinforced-concrete building for installing conduit risers, much trouble and expense is involved in their subsequent installation. Frequently one finds in concrete buildings that the risers have not been installed until after the concrete work was completed, which means that it was necessary to drill through solid floors with the probable chance of striking metal reinforcement, which was likely to cause the hole to be enlarged, or to require another hole to be drilled, either of which throws the riser from the true vertical. Of course, this is very slow and expensive work and therefore everything should be done to secure a proper location of the risers and provision so that they may be installed easily.

I have found that where the size and location of the risers have been shown on the plans the best method of avoiding drilling of floors is to provide a set of bushings through the forms before the concrete is poured. For this purpose I procure a quantity of metal downspout, preferably smooth pipe in place of corrugated. The inside diameter of this spout should be slightly larger than the outside diameter of the conduit. Several different sizes may be needed. Slot the end of the spout with a pair of ordinary tin snips to the depth of one inch or more. The width of the slots can vary. Then bend the metal outward at right angles between the slots, so as to form a sort of broken flange. Cut the spout about one inch longer than the thickness of the floor. Now locate the position of the conduit riser and mark it on the concrete form. Then fasten the spout securely to the form where the conduit is to be installed, nailing through the flange to secure the inverted spout to the form. The top of the spout should then reach about one inch above the finished floor. The spout is then filled with sand. The reinforcement and concrete are then put in place without chance of disturbing the spout, which when the form is removed and sand allowed to run out leaves a clear hole through which riser is easly run.

Among the Contractors.

Fred Peacock, who has taken over the electrical business of Ferdinand Stenger, now located at 915 Vine Street, Cincinnati, Ohio, has leased the storeroom, 909 Vine Street.

The Hubbard Electric Company of Beloit, Kans., was awaredd the electrical contract for the Concordia High School building. The amount of the contract was $2400. This will be a complete conduit job. The architects are W. H. Hulse & Company.

New Electrical Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Westinghouse-LeBlanc Jet Condensers.

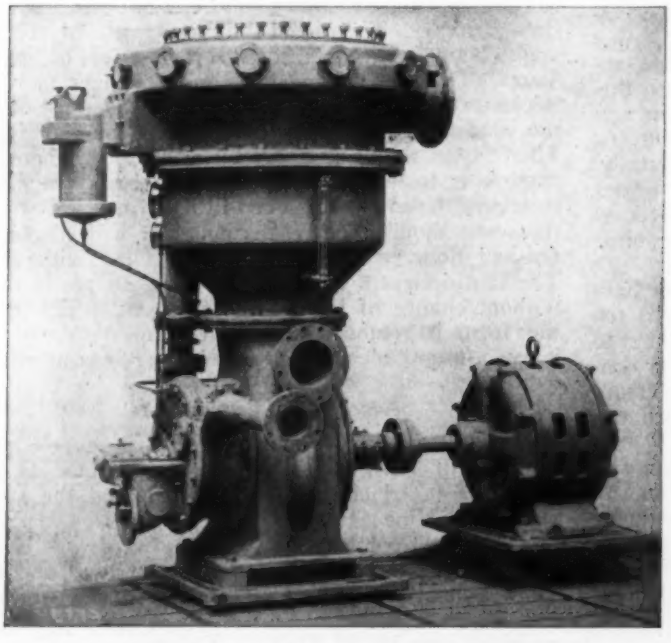
Condensers may be divided into two general groups: surface condensers in which the steam does not come in contact with the cooling water and the heat is abstracted through the walls of the tubes, and jet condensers in which the steam is condensed by coming in direct contact with the cooling water. In general, surface condensers are used when the cooling water cannot be used in the boilers without treating, jet condensers being used when cooling water is suitable for boiler feed.

With the introduction of the steam turbine in the power plant, condensers capable of maintaining 28 to 29 inches vacuum or better were developed, whereas 26 to 27 inches is as high a vacuum as could be utilized by the turbine's predecessor, the reciprocating steam engine. Since most turbines can carry only about one-half their full load when operating noncondensing, it is quite essential that condensers serving them be reliable in operation and capable of producing the desired vacuum without danger of shutdown.

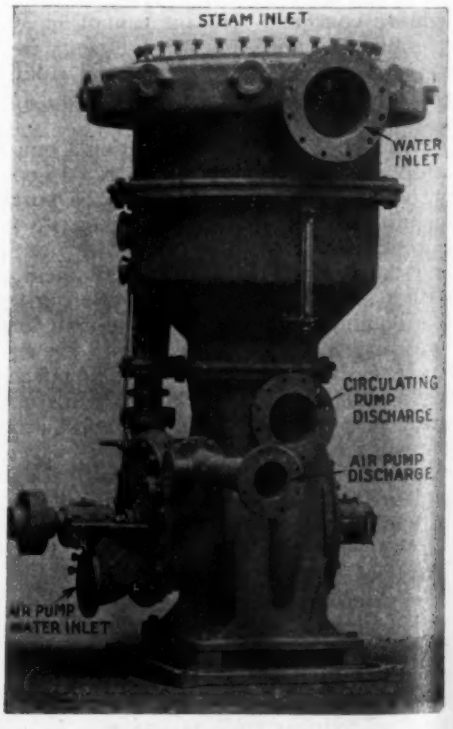
The Westinghouse-LeBlanc jet condenser has been designed with a view to simplicity, ruggedness and reliability. Its component parts are condenser body with vacuum breaker, centrifugal removal or circulating pump, LeBlanc air pump, mounted on the same shaft as the circulating pump, and suitable drives. Cooling water by virtue of the vacuum in the condenser is drawn into the condenser head by opening shown in one of the accompanying illustrations. To take care of pipe friction and reduced suction of low vacua, the suction lift should not be more than 18 feet. The water enters an annular water box with nozzles directed toward the center of the annulus. Hand holes are provided for cleaning out the sticks and debris that may collect in the water box, clogging the nozzles. These nozzles break the water up into a whirling spray directed from all sides of the inlet chamber. Since most of these condensers are used with steam turbines, the steam inlet is in the top of the condenser as shown. This allows the condenser to be placed directly underneath the turbine which it is to serve, reduces the headroom to a minimum and eliminates complicated exhaust piping. As the steam flows down through the inlet chamber it is met on all sides by the whirling spray which insures that all of the steam will be immediately condensed.

The condensed steam and cooling water falls to the base of the condenser, where it is discharged by the circulating pump. This pump is of the double-suction centrifugal type and more or less of standard design. The pump body forms the base of the condenser supporting the condenser body and making a very compact unit. The circulating pump can be designed to operate against heads encountered in cooling tower and spray-pond installations so that a booster pump is not needed.

On the heavy steel, bronze-sleeved circulating-pump shaft is also mounted the air-pump runner. The air-

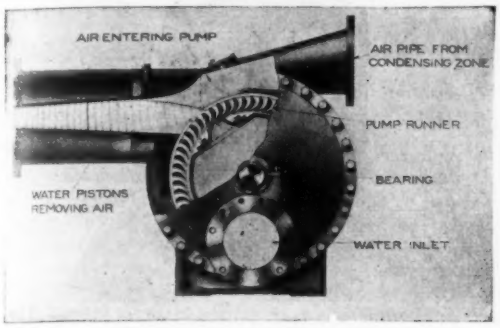


Westinghouse-Leblanc Jet Condenser Complete with Auxiliaries.



Condenser Body and Pumps.

pump casing is cast separate from the circulating-pump casing but is bolted directly to the side of it. Both runners can be removed axially without disturbing the setting of the condenser. There are only two bearings which are of the babbitted ring-oiled type. To pre-



LeBlanc Air Pump.

vent air leaking into the condenser the stuffing boxes are water sealed.

One of the illustrations shows the construction and operation of the LeBlanc air pump. The runner and such parts of the pump as are subject to heavy wear are made of bronze. Water is drawn into the central part of the pump through the inlet as shown. It then goes through the distributor, where it is sliced into thin layers and propelled with high velocity into the collector cone. In passing into the collector cone, each successive layer or film of water entraps a portion of air and with the displacing effect of a piston, drives it out through a conical shaped pipe, called a diffuser, against atmospheric pressure. To facilitate quick starting a steam ejector is placed at the entrance to the diffuser.

The advantages of this type of pump are quite evident. No close clearances or reciprocating parts are used. This eliminates wear and any delicate adjustments. The water passages are of such size that fairly large objects can pass through the pump without clogging it or impairing its operation. There is only one moving element, the rotor, which makes for low maintenance on the pump. Constant volumetric efficiency of the pump makes it especially useful and efficient in high vacua work; in fact, a vacuum within one-tenth inch of the barometer has been obtained with this pump. The pumps are standardized at 700 revolutions per minute so that either an efficient high-speed turbine with gear or a direct-connected motor may be used for a drive. The drive is selected according to the individual application. In plants where the exhaust steam from a turbine cannot be used, motors are used for driving the pumps. In other installations where the exhaust steam from the turbine is needed only a part of the time, both the turbine and motor are connected to the pump on opposite sides of the condenser. This provides for a heat balance so that as much steam as desired can be passed through the turbine, the motor being placed in operation when the full-load steam on the turbine is not required.

A quick-acting vacuum breaker is supplied with each condenser. If for any reason, the pumps should stop, the water level in the condenser would rise rapidly, due to the vacuum in the condenser and exhaust piping. When the water reaches a predetermined level the vacuum breaker comes into operation, letting air into the condenser and vitiating the vacuum. The vacuum breaker operates with a float and is water sealed. In installations where it is expedient to use forced injection instead of natural suction, an automatic shut-off valve should be placed in the injection line. This shut-off valve is connected to the vacuum breaker so that, when the vacuum breaker operates, the supply of injection water is automatically shut off, preventing flooding of the turbine.

These condensers are not always installed in single units. In some cases where a more flexible unit is desired or the basement headroom is limited, twin condensers are installed with individual drive for each condenser. When cold water is available, it is possible to operate only one of the condensers and get the desired vacuum, whereas in the summer, when the water is warm, both condensers are operated. Westinghouse-LeBlanc jet condensers have been operated successfully with turbines up to 40,000 kilowatts capacity. Although it is perfectly feasible to build single units larger, as yet, single condensers have not been applied to turbines above 25,000 kilowatts capacity. Above this size it has been found preferable to use twin units because single units woud be so enormous as to preclude their installation in an ordinary power plant.

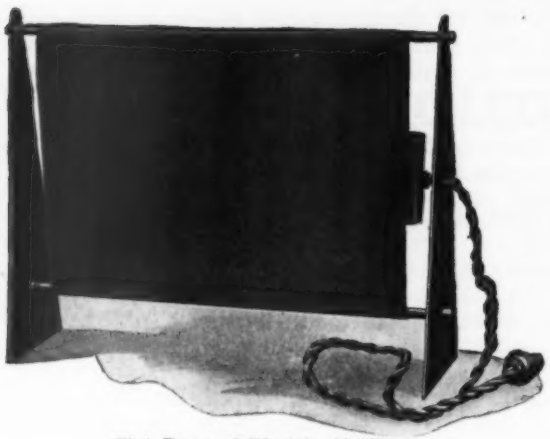
New Electric Radiators or Air Heaters.

The early approach of cool weather requires the provision of some means for warming up bathrooms, bedrooms, and other small apartments before the regular furnace or boiler for winter heating is started up. To run the regular heating plant is hardly called for when heat is required only on chilly mornings and evenings.

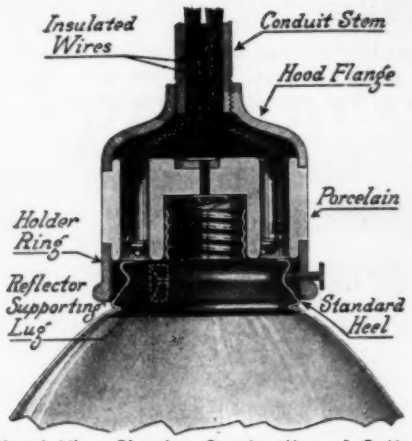
For this purpose, as well as to help out in supplying additional heat on very cold days, the S-P Stove Company, Inc., Wilmette, Ill., has placed on the market a number of air heaters, ranging in wattage up to 4000 watts. The smaller ones, taking only about 660 watts, are especially suited for use in bedrooms, bathrooms, physicians' offices and the like. For larger rooms the capacity of the heater is 1300 watts or more. The heaters are made in two forms; the round one has a diameter of about 7 inches and height of 21 inches. It provides about six square feet of heating surface. This is a very neat heater, and, weighing only 12 pounds, can be readily moved from place to place where needed.

Another form is the flat one made with the heating surface spread out in one plane. In the smaller size

Round Form of Electric Heater.



Flat Form of Electric Air Heater.



Cross-Sectional View Showing Construction of Cutter Holder-Socket.

this has three square feet of heating surface. The length of this radiator is 20 inches and the height 16 inches; its weight is only six pounds.

Both of these types are finished in either black japan or gold bronze. By providing a considerable area in the heating surface the temperature of the room is quickly raised and very good diffusion of the heat is obtained.

Cutter Holder Sockets for Standard Heel Reflectors.

A new device which combines a holder for standard heel reflectors and a socket for Mazda lamps has recently been designed and placed on the market by the George Cutter Company, South Bend, Ind. The holder-socket, as the new device is called, is made in three different styles: with hood flange for attachment to half-inch conduit, with four-inch cover for attachment to outlet boxes, and with porcelain bushing for drop-cord suspension. It is also made in two sizes, for 2¼ and 3¼-inch standard heel reflectors.

One of the most important considerations entering into the design of the holder-socket is simplicity of construction. The result has been a very compact device that is not only easy to wire but possesses a number of other advantageous features. As stated by the manufacturer, these include: First, the reflector is held level and secure in its correct position with respect to the lamp filament. Second, the reflector body is insulated from the conduit. Third, the method of supporting the reflector is very simple, one thumb-screw locking it firmly in place. Fourth, reflectors may be removed and replaced by a few turns of the thumb-screw. Fifth, the holder-socket with outlet-box cover permits of the installation of reflectors as close as possible to the ceiling, a decided advantage in installations where the headroom in a building is low.

One of the accompanying illustrations shows the construction of the holder-socket. It consists of a cast-iron ring which has two lugs and a thumb-screw for engaging the groove in the heel of the reflector. This ring is attached, by means of two screws, to a porcelain body which includes the socket shell and wiring terminals. The porcelain body is attached to a hood flange tapped for half-inch conduit or to a four-inch outlet-box cover by means of two screws which are independent of the screws which support the holder ring.

It can readily be seen that the holder-socket is easily and quickly installed. It is claimed one of these holders can be installed by one man in two minutes, thus effecting material savings on installation costs. For attachment to conduit stems it is only necessary to screw the hood flange to the conduit, thread the wires through the holes in the porcelain body, fasten the socket to the hood flange and connect the wires to the terminals. For attachment to outlet boxes the installation is even more simple, only two operations being necessary to wire the holder-socket complete and ready for the lamp and reflector.

The holder-socket will undoubtedly form a valuable addition to the line of industrial lighting reflectors.

Cutter Holder-Sockets with Hood Flange for Attachment to Conduit, and with Cover for Attachment to Outlet Box.

New Industrial-Lighting Unit Designed to Minimize Glare.

The Luminous Unit Company, St. Louis, Mo., is placing on the market a new industrial-lighting unit to be known by the trade-marked name of Industrolite. The unit is composed of two essential elements, an upper reflector of white porcelain-enameled steel, and a porcelain-enameled reflecting band which is suspended from the upper reflector in such position that it will intercept all light within the angles of 45 degrees and 85 degrees and direct it to the upper reflector for redirection to useful angles.

In this manner glare within the normal range of vision is entirely eliminated, and this elimination is accomplished with very little loss in efficiency of the unit. The outfit is practically an indirect unit, because direct light comes through only a small opening below the tip of the lamp bulb.

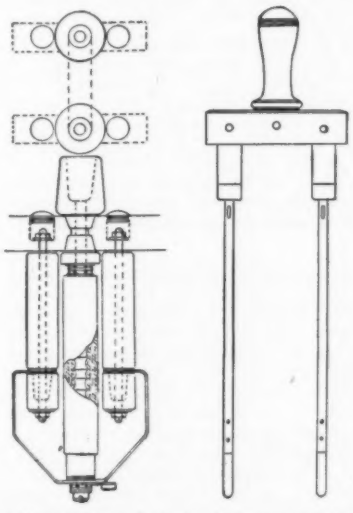
Industrolite Unit for Glare Free Shop Lighting.

The arrangement of parts is such that all light is emitted below the horizontal plane, the distribution of light from the unit being more or less intensive, and the utilization efficiency being therefore quite high. The unit is being made at present in sizes suitable for 200, 300, 400 and 500-watt type C Mazda lamps.

Dead-Front Plug Switches for Series Lighting Circuits.

The predominant characteristic of the "stab" or plug switch is that it is a simple, inexpensive appliance which can be used to make and break small currents at comparatively high voltage with safety. This feature has made this type of switch particularly suitable for use on both primary and secondary sides of constant-current transformers in connection with series arc and incandescent lighting. It is used also on small-capacity feeder circuits up to 2,500 volts.

Plug switches are either single or double break and as made today possess certain improvements which give better protection to the operator. In the older types the line ran to the receptacle at its inner end and the parts protruding through the panel were always alive. Now, because of general changes in design,



Dead-Front Plug Switch of Improved Design.

the current leads are attached to the outer ends of the receptacle and the parts accessible from the front of the panel are dead when the plug is not in place.

The single-plug switch has been provided with greater insulation and the plug with a larger handle. The new plug is much safer than the older type and in conjunction with the new method of making connections is extremely satisfactory from the viewpoint of safety.

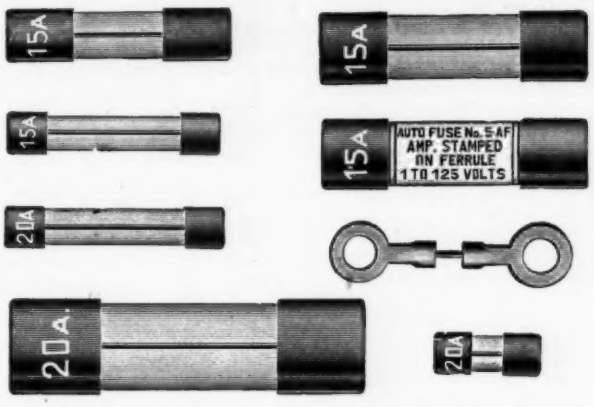
The double-plug switch follows the design of the single-pole element in the use of tube insulation, porcelain and brass supports, etc., but each complete switch consists of two tubuluar receptacles and a two-plug double-break switch per pole.

The entrance bushings for receptacles are of molded material and extra large in size. The two-plug switches have thick, wide crossbars which constitute a guard and an additional protection. Receptacles and plugs are identical for both open-circuiting and short-circuiting, but the arrangement of receptacles is such that there can be no confusion in operation.

These switches are made by the General Electric Company, Schenectady, N. Y.

Bussmann Automobile Fuses.

The increasing use of electric equipment in the ordinary gasoline automobile requires more attention to the adequate protection for the electric wiring and apparatus, so as to prevent damage to batteries, magnetos, distributors, spark plugs, etc. In the early days of the automobile industry fuses were seldom provided, but when short circuits or grounds occurred in the wiring, the batteries were quickly run down with-



Assortment of Buss Automobile Fuses, Chiefly of the Glass-Tube Cartridge Type.

out giving any warning and with the likelihood that the driver would be stalled in some out-of-way place.

For this special purpose the Bussmann Manufacturing Company, St. Louis, Mo., has placed on the market a special line of what are trade-marked as the "Buss Auto Fuses." They are made in several sizes and capacities to meet the requirements of the different types of electric equipment used on the great variety of gas cars now on the market. Nearly all of them are of the cartridge type, with either glass or fiber tubes.

In carrying capacity these fuses are rated at 5, 10, 15, 20, 30 and 35 amperes. In the accompanying illustrations are shown a few of these typical fuses, of which it will be noted six are of the glass-tube type. One has a fiber tube. In all of these cartridge fuses the ampere capacity is clearly stamped on the ferrule at one end.

These fuses are packed 10 fuses in a carton and 10 cartons in a box, as shown in another illustration. This makes it very convenient for the dealer or garage man to supply any type of fuse desired.

Method of Shipping and Displaying Buss Automobile Fuses.

Activities in the Trade

Harvey Hubbell, Inc., Bridgeport, Conn., announces a 10-per-cent advance on prices of Hubbell reflectors, listed under schedule "C." This change became effective September 15.

Ideal Gas & Electric Fixture Company, New York, has acquired a five-story building at 433 Broadway, corner of Howard Street, for a new works and retail establishment. Henry Ferrando is president.

Bryant Electric Company, Bridgeport, Conn., describes its electric wiring devices, sockets for candle fixtures, receptacle and switch combinations for getting a tap circuit, heater control combinations, and canopy top. All these and other devices are illustrated in its system of folders, in which prices are given.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., is planning to inaugurate operations at its new works, now in course of construction at Essington, near Philadelphia, on January 1. The plant will be devoted to the manufacture of turbines and turbine equipment and will give employment to about 5,000 hands at this date. It is expected to employ about 22,000 men when the plant is in full operation in 1918, with pay roll of about $400,000. This will be the twenty-first plant of the company.

The Burt Manufacturing Company, Akron, Ohio, sends out a 125-page book, in magazine form, devoted to the Burt oil filtering system, exhaust heads and ventilators. A fine illustration of the company's plant is given. The saving of waste lubricating is discussed, and also free flow of lubricants as essential. Cost of lubrication is also taken up. The company's equipment is well illustrated and their operations described. The filter installations in their relations to engines, turbines and other equipment are presented. The several types of oil filters are clearly shown.

David A. Wright, 568 W. Washington Street, Chicago, recently purchased the patents, models and patterns of the Fifield triple-geared lathes, formerly made at Lowell, Mass. Mr. Wright has begun the manufacture and sale of this lathe for which he has received a large number of orders. He is prepared to make lathes in 34-inch, 40-inch, 50-inch, 60-inch, 72-inch, 84-inch and 96-inch sizes, using bedplates of 12, 14, 16, 18 and 22 feet in length. Lathes of this size and type are much in demand in shops of shipbuilding plants, where the electric drive is adopted. He is developing a special motor drive suited to this machine.

Central Electric Company, Chicago, announces that the distribution of its Holiday Goods catalog, "Things Electrical," last year will be repeated this season. The plan is to furnish customers, who place stock orders for holiday goods, with a supply of catalogs in proportion to the size of orders. The catalogs are nicely gotten up, and contain no reference to the company furnishing them, and to all intent and purpose have been printed exclusively for the dealer using them. Except in the largest cities, this proposition is offered to but one dealer in a place. This scheme of distribution on the part of the Central Electric Company is one of the most effective sales helps offered retailers of electrical devices.

Bridgeport Brass Company, Bridgeport, Conn., has issued new Bulletin No. 10, devoted to Phono-Electric trolley wire. This is a 36-page pamphlet, well printed on superior glazed paper, and adorned with many half-tone illustrations of city and interurban scenes in which electric trolley lines are shown; and in all such pictures the use of Phono-Electric wires is emphasized. These are alloy wires, uniform in hardness throughout their texture, giving them uniform wearing qualities. The special claims for this alloy wire are its wearing durability and minimum liability to breakage. This company claims for it three times the average life of the hard-drawn copper wire. In conductivity, the Phono-Electric trolley wire is conceded to be not equal to copper wire, but it is maintained that, in this day of higher voltages, increased ampereage, feeder tie-in systems and automatic substations, the maximum of conductivity in the trolley wire itself is not of as great importance as formerly. Each illustration is accompanied by an explanation of the car service and the overhead trolley and feeder systems.

Chicago Mica Company, Valparaiso, Ind., now places the following guaranty upon invoices of goods shipped to dealers and consumers: "We, the undersigned, do hereby guarantee that goods herein were manufactured or produced in accordance with the Federal Child Labor Act of September 1, 1916."

The Federal Sign System (Electric) is erecting an electric sign for the Apollo Theater, Kansas City, Mo. It will be a vertical sign, 26 feet high, spelling the word Apollo in three-foot letters, with a colored crest and border. Below this will be a three line changeable attraction sign. This sign will be one of the best moving picture signs and it is claimed the only one of its kind in the world.

Homestead Valve Manufacturing Company, Homestead, Pa., has about completed the rebuilding of its plant and office buildings, adding 75 per cent to the space required for the increase of its business. Considerable new machinery and equipment have been put in, especially in the foundry, where production is being about doubled. This company's quarter-turn valves are much used in the munitions and powder industries, and have been in demand by the Government, and among the European allies.

The Leeds & Northrup Company, Philadelphia, makes a specialty of electrical measuring instruments. This company's system of measuring the temperature of incandescent bodies is described. Its optical pyrometer, developed under the Morse patents, reaches a high degree of accuracy. The principles of this instrument and the manner of using it are explained in the company's Bulletin No. 860, which is an instructive piece of trade and technical literature. The Brooks inductometer, designed by H. B. Brooks and F. C. Weaver of the Bureau of Standards, is also illustrated and described.

Automatic Sprinkler Company of America, 123-133 Williams Street, New York City, and having branches in all other large cities, has issued a 40-page, illustrated book entitled "The Pursuit of Safety," dealing with the subject of fire protection, and the automatic sprinkler as a ready means of extinguishing fires in stores, plants and factories. The falacy of the term "fireproof," as applied to so many buildings is referred to. The fireproof walls and floors of a structure do not prevent its contents from burning. The utility of an automatic sprinkler is in extinguishing a fire before it can spread. The sprinkler installation is not only applicable to buildings, but to lumber yards, shipbuilding plants and docks. The four automatic heads that go with this system are illustrated, as are also many scenes where automatic sprinklers are in use. The book worth reading.

George Cutter Company, South Bend, Ind., has issued Bulletin No. 3310, entitled "Cutter White-Way Lighting." This pamphlet gives much valuable information on ornamental street-lighting systems. It discusses the three essentials of a satisfactory White-Way system, the relative merits of single-light and cluster posts, the selection and arrangement of the standards, lamp and unit efficiencies, cable for underground distribution systems, installation costs, and other features connected with the design of the system as a whole and of its essential details. Special illustrations and descriptions are included of Cutter Arcadian and Suburban posts, which are simple but very graceful standards; other equipment described includes Cutter Sol-lux globes, Regent film sockets, disconnecting potheads, etc. Another publication gotten out by the company is Bulletin No. 3313, entitled "Cutter Handy Wiring Tables and Illumination Data." This 32-page booklet is well gotten up. It contains simple wiring formulas and tables, simple rules for illumination calculations and for planning a lighting system, special hints for industrial lighting in general, railway-yard and factory-yard lighting, billboard and wall-sign lighting, etc. Illustrated descriptions are included of Cutter holder sockets, Sol-lux reflectors, Universal flood-lighting projectors, Sol-lux fixtures, etc. Both these publications will be found of value to electrical men concerned with the respective subjects of street lighting and industrial lighting. They can be obtained on request to the company.

Personal and Biographical

CLAUDE G. MATTHEWS recently was transferred from the Dallas office to the San Antonio branch, in Texas, of the Western Electric Company.

G. B. SANFORD has been appointed district manager at Sacramento, Cal., for the Great Western Power Company. He formerly was with that company at Rio Vista, Cal.

FREDERICK SMITH has been appointed district superintendent of plant at Sacramento, Cal., for the Pacific Telephone & Telegraph Company, succeeding J. F. Lowrie, who was transferred to other duties.

J. B. SHICKEL recently was appointed superintendent and electrical engineer of the Menominee and Marinette Light & Traction Company, Menominee, Mich. He formerly was with the General Electric Company.

H. B. PEIRCE, who held the position of assistant commercial agent of the Washington Water Power Company, Spokane, Wash., for some time, has resigned to engage in commercial engineering work in Russia.

W. A. BITTNER, formerly purchasing agent for Union Electric Company, Pittsburgh, has associated himself with Ralph C. Sperry, to engage in the manufacturing business at Pittsburgh, under the firm name of Sperry & Bittner.

JAY B. FRANKE, city electrician of Perth Amboy, N. J., has been re-elected to membership on the executive committee of the International Association of Municipal Engineers, at its annual convention at Niagara Falls, N. Y.

L. J. TODHUNTER, formerly assistant manager of the electrical department of Hendrie & Bolthoff Manufacturing & Supply Company, Denver, Colo., has become manager of the electrical department of Herr-Rubincam Supply Company, that city.

F. D. NIMS, formerly engineer and assistant manager for the Olympia Power Company, Port Angeles, Wash., is now connected with the Northwest Electric & Waterworks Company, of Montesano, that state, and has headquarters at Seattle.

THEO. N. VAIL, president of American Telephone and Telegraph Company, was the recipient of an artistically executed medal, presented recently by friends and associates, to commemorate his forty years of service to the Bell telephone system, and the tenth anniversary of his election as president of the American Telephone and Telegraph Company.

FRED M. LEGE, Jr., formerly manager of the Brush Electric Light & Power Company, Galveston, Texas, has been elected president of the Terrell Electric Light Company, Terrell, Texas, a property recently acquired by Fred M. Lege, Sr. Kenneth M. Mason, formerly secretary and treasurer of the Brush Electric Light & Power Company, is vice-president, secretary and treasurer of the Terrell utility.

LYNN J. HICKMAN, who has been manager of the Public Service Company's plant at Aurora, Neb., is now assistant general manager and will spend part of his time at the plant at York, Neb., having charge of plant supervision and relieving Manager Harvey from a share of the heavy work he has been doing. The company is making improvements at York, to care for its increasing business.

H. C. BLACKWELL, vice-president and general manager of the People's Light Company, Davenport, Iowa, has resigned to accept the general managership of the Kansas City Light and Power Company, Kansas City, Mo. He will take up his new duties early in October, thus continuing his association with Joseph F. Porter, who is now president of the Kansas City company. Mr. Blackwell was graduated from Purdue University in 1902, as mechanical engineer. Among his earlier experiences, following graduation, was work with Wm. B. Schafe & Sons Company, Pittsburgh, in the water softening department. He was for some time chief engineer of the Wabash railroad, at St. Louis, in the civil engineering department. His work in association with Mr. Porter started with the construction work for J. J. White & Company on the interurban between Alton and East St. Louis. He had charge of the electrification of the horse-car line at Centralia, Illinois, where a power house was built, and directed the operation of that road. He went to Davenport 11 years ago as engineer for the electrical enterprises with which Mr. Porter was connected. In addition to the duties of vice-president and general manager of the People's Light Company, at Davenport, he was a director of the Tri-City Railway & Light Company, of which Mr. Porter was president. Mr. Blackwell had also served some years as gas engineer for the United Light & Railways Company, of Grand Rapids, Mich. He is widely known in both electrical and street railway circles.

H. C. Blackwell.

CARL C. DEGENHARDT, formerly of the bond department of H. M. Byllesby & Company, has been appointed sales manager of the New York office of the company.

STANLEY GOSSARD, Blair, Neb., has resigned as secretary and manager of the Blair Telephone Company, to be effective October 2. It is stated he may try his hand at farming next spring.

ROBERT D. GRAHAM has been re-elected president of the Citizens' Telephone Company, Grand Rapids, Mich. Other officers were re-elected with the exception of treasurer, T. H. Goodspeed succeeding John B. Martin in that capacity.

FRANKLIN T. GRIFFITH, president of Portland Railway, Light & Power Company, addressed the Oregon Society of Engineers, at its monthly meeting, at Portland, September 20, on the company's needs for greater revenue in its transportation department.

ADRIAN TOBIAS, for two years superintendent of the meter department of the Mahoning & Shenango Railway & Light Company, Youngstown, O., has re-entered the employ of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, Pa.

F. H. POSS, former sales and advertising manager of the central district for Benjamin Electric & Manufacturing Company, Chicago, has resigned his position and returned to San Francisco, where he formerly lived. He will take up western distribution for the Avery tractors.

C. P. GROSS, who is in charge of the electric and water department at Grand Rapids, Wis., will resign October 15, to accept a position with the Middle West Utility Company. He will be stationed at Nebraska City, Neb., and will have charge of the lighting, heating and waterworks in that city.

HAROLD V. BOZELL has resigned the professorship of electrical engineering at the University of Oklahoma, to accept the position of assistant professor of electrical engineering in the Sheffield Scientific School of Yale University. He had held his position in University of Oklahoma for nine years.

JACK H. FROHLICH has joined the publicity staff of the Society for Electrical Development under Harry W. Alexander, Director of Publicity. Mr. Frohlich has been with the Frank Seaman Advertising Agency, New York, and before that was publicity agent for the Vitagraph Company of America.

G. B. WEBER, for seven years associated with the sales department of Benjamin Electric & Manufacturing Company, at Chicago office, has been made sales manager; and P. A. Powers, for the last three years connected with the publicity department, has been advanced to the position of advertising manager. Both men have worked up to their new positions by close application to their respective lines, and have many friends in the trade.

EDMUND T. PERKINS, consulting and supervising engineer in connection with drainage, flood-protection and irrigation projects, having offices in Chicago and Quincy, Ill., is a candidate for appointment as one of the seven members of the Federal Waterways Commission. The creation of such commission is provided for in the Rivers and Harbors bill which recently became a law, and the members thereof are to be appointed by the President. Mr. Perkins has had an experience of 20 years in hydraulic and other branches of engineering. This included work with the U. S. Geological Survey and the U. S. Reclamation Service, in which he had charge of important work in the West and Southwest in connection with stream gauging, determining run-off factors, and irrigation projects. As a member of the Everglades Engineering Commission of Florida, associated therein with Isham Randolph and M. O. Leighton, he reported on the feasibility of reclaiming the Everglades, and plans of this commission were adopted by the State, and the first unit outlined therein is under construction, the entire project involving an expenditure of about $30,000,000.

He is now consulting and supervising engineer for a number of important drainage districts in Illinois, Iowa and Missouri, whose drainage projects are being carried through.

Mr. Perkins, who was born at Scottsville, Va., in 1864, is a graduate of Union College, Schenectady, N. Y.

THOMAS EWING, who recently resigned his position as Commissioner of Patents, in which he ably directed the affairs of the United States Patent Office for four years, was inadvertently made the victim of a makeup error in our last issue. A personal note regarding his resumption of the practice of law was strangely included among the obituary items. We trust Mr. Ewing will forgive this error. Our readers may be assured that, in spite of the fact that the Patent Office mourns the departure of a most capable administrator, Mr. Ewing is very much alive and able to unravel with his former skill the legal tangles of his many clients. His office is at 160 Broadway, New York City, where he has gathered about him a corps of experienced assistants.

Obituary.

GEORGE A. BEACH, one of the old time residents of Chicago, who at one time was associate telegraph operator with Thomas A. Edison on lines in southern Michigan, died last week at the residence of his son, P. G. Beach, in Chicago. He was a brother of Frank G. Beach, general manager of the Central Union Telegraph Company, and was many years general manager of telegraph lines of the Wabash system. Mr. Beach was 81 years old, and is survived by one daughter and two sons, Mrs. Corra Beach-Shumway, Cleveland; P. G. Beach, Chicago, and Chas. U. Beach, Oakland, Cal.

Men in Government Service

Items of Interest Concerning Power and Electrical Men Who Have Joined the Colors

G. C. SMITH, chief electrician of an industrial plant, at Okmulgee, Okla., has responded to the nation's call for military duty.

R. H. CARNAHAN, JR., 526 Rush street, Chicago, up to this time an electrician in central-station work, has entered the army and recently departed with his regiment to Houston, Texas.

ALEXANDER MCKINLOCK, son of George A. McKinlock, president of the Central Electric Company, Chicago, Ill., has joined the fighting forces and sailed last week for France.

ALLEN J. CALLAWAY, buyer for the San Francisco branch of Western Electric Company, is now a first lieutenant of the A. T. & T. Telegraph Battalion, now at Monterey encampment.

HARRY C. TURNOCK, president and general manager, Electric Construction & Sales Company, Cleveland, has been commissioned a first lieutenant, and is now in the Coast Defense Artillery, with headquarters at Fortress Munroe, Va.

F. P. RICE, who was identified with the publicity department of Benjamin Electric & Manufacturing Company, Chicago, for six years, has been called to the colors, and reported for duty at Camp Grant, Rockford, Ill., on September 20.

BOYD HAMMON, who was district manager at Sacramento, Cal., for the Great Western Power Company, has joined the Signal Corps of the United States Army. G. B. Sanford has succeeded him as district manager for the company at Sacramento.

MAJ. J. D. DUNSWORTH, commanding at Chanute aviation field, Rantoul, Ill., has been called to Atlantic Coast points; and Maj. J. E. C. McDonnell, head of the Tenth Aerial Squadron at Chanute field, will act as commanding officer until a regular assignment is made from Washington.

W. S. QUINLAN, of Adams-Bagnall Electric Company, Cleveland, is now an officer in the Quartermaster's Department, Washington, D. C.

W. B. HICKOX, vice-president of Adams-Bagnall Electric Company, Cleveland, O., has entered military service, being now a captain in the Ordnance Department at Washington, D. C.

CAPTAIN E. H. MARTINDALE has been ordered to report at Fort Leavenworth, Kans., and passed through Chicago on September 28 with his family to assume his new duties. Captain Martindale in civil life is sales engineer for the National Carbon Company, Cleveland, O., and is on the Board of Managers of the American Institute of Electrical Engineers.

GEORGE E. SHEPHERD, electrical engineer of Shepherd & Rust, 42 West Market street, Wilkes-Barre, Pa., has been honored with a captain's commission in the engineer department of the United States Reserves.

CAPTAIN ALVIN A. KUECHENMEISTER until recently a member of the engineering staff of the Milwaukee (Wis.) Electric Railway & Light Company has been commissioned captain of field artillery. After serving as instructor in the school of fire at Fort Sill, Oklahoma, he was ordered to report to Waco, Texas, where he is now stationed.

DAYTON POWER & LIGHT COMPANY employees responded promptly to their country's call, seven of whom enlisted in Battery D, Ohio Field Artillery, and are now at Camp Sheridan, Alabama. Their names are: R. Pulmmer, Howard Tansey, Charles Bell, Richard Eckert, Dewey Walton, Frank Kendig and Charles Collins. W. H. Miller entered the First Officers' Reserve training camp at Fort Benjamin Harrison, and is now at the Wilbur Wright aviation field; K. C. Long and H. J. Hyre joined the Second Officers' Reserve camp and are now at Fort Benjamin Harrison; R. M. Frampton joined the Navy as a first-class electrician; Stanley Copp also entered the Navy and is a wireless operator at Brooklyn Navy Yard; Mack Thorp is in Coast Defense service, and R. A. Von Derau joined the Signal Corps and is at Wilbur Wright field. This utility is represented by R. E. Pflaum, at Camp Sherman, Chillicothe; by Homer Short, James Lickliter, Harry Davis, H. E. Martin and R. Copeland, who are soon to be at Camp Sherman.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW will *welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

RUTLAND, VT. — Rutland Railway, Light & Power Company has completed the construction of its new transmission line from its Rutland substation to West Rutland.

BOSTON, MASS.—C. E. Cotting, Barristers Hall, plans the construction of a new one-story transformer house, about 20x55 feet. Contract for erection has been awarded to the Walter H. Preble Company, 11 Pemberton Square, Boston.

SHELTON, CONN.—Sidney Blumenthal & Company, Inc., have awarded a contract for the construction of a new one-story power house, about 27x150 feet, to Thompson, Binger & Company, Inc., 280 Madison Avenue, New York, at $35,000.

BINGHAMPTON, N. Y.—Binghampton Light, Heat & Power Company has inaugurated operations at its new plant, and is now carrying a load of 600 kilowatts daily of the load of the old plant. The company proposes to take over the entire load of the old plant immediately upon the completion of its new substation and 30,000-volt transmission line. Foundations for the steel towers for this line have been completed and the work is progressing rapidly.

BUFFALO, N. Y.—Board of Managers has awarded a contract to the Robertson-Cataract Electric Company, 151 West Mohawk Street, for the installation of lighting fixtures and kindred equipment in the new city hospital, at $20,968.

BUFFALO, N. Y.—American Radiator Company is planning for the installation of new six-ton electric furnaces of the Greaves-Etchells type.

FULTON, N. Y.—Chicago Conduit Company is making rapid progress in the construction of its new local plant.

NEW YORK, N. Y.—Interborough Rapid Transit Company has acquired property at 2633 Jerome Avenue, about 100x113 feet, at a price of approximately $26,000, for the erection of a new transformer station.

ROCHESTER, N. Y.—George Keith, 155 Exchange Street, has awarded a contract for the construction of a new one-story power house addition to his plant, about 26x48 feet, at a cost of $10,000. A. Friederich & Sons Company, 710 Lake Avenue, Rochester, has the contract for erection.

SLOATSBURG, N. Y.—Ramapo Finishing Corporation has awarded a contract for the construction of a one-story brick power house, about 75x150 feet, to J. M. Rooney, 65 Brookside Avenue, Nyack. Charles H. Tenney & Company, 201 Devonshire Street, Boston, Mass., are the engineers.

BORDENTOWN, N. J.—City Commission is planning for the construction of a municipal electric lighting plant near Mile Hollow and for the installation of new 600-candlepower lighting units in a number of streets.

HASBROUCK HEIGHTS, N. J.—New York Telephone Company, 15 Dey Street, New York, has awarded a contract for the construction of a new two-story addition to its local exchange plant, about 24x46 feet, to cost about $9000. F. Milani, Hasbrouck Heights, is the contractor.

HOPEWELL, N. J.—Borough Council is planning for improvements in its street-lighting system. The Public Service Corporation has submitted a bid for the furnishing of service for this improved system.

JERSEY CITY, N. J.—Public Service Electric Company has been awarded a five-year contract by the Board of Freeholders for the lighting of country roads, institutions and parks.

NEWARK, N. J.—Common Council will receive bids until October 2 for the installation of electrical equipment in the new fire house at Sandford Avenue and Palm Street.

NEWTON, N. J.—Sussex Print Works, Sparta Avenue, have had plans prepared for the construction of a new one-story power house addition, about 50x50 feet, to cost about $7000. Andrew Kidd, Jr., 96 Liberty Street, New York, is the architect.

PERTH AMBOY, N. J.—Board of Aldermen is planning for the immediate installation of new units and other equipment at the municipal lighting plant to improve the commercial lighting system.

PRINCETON, N. J.—Public Service Corporation has completed the installation of an underground conduit system in Stockton Street, and is planning for an improved lighting system on this thoroughfare.

TRENTON, N. J.—Public Service Electric Company will make improvements in its system on Liberty street, from Adeline street to Olden Avenue.

ANNVILLE, PA.—Calcite Quarry Company will install electric equipment in its quarries at Myerstown, to replace the steam motive power heretofore in use.

BOYERTOWN, PA.—Boyertown Electric Company is planning extensive improvements in its transmission lines from Boyertown to Bally.

CHESTER, PA.—Philadelphia Electric Company has acquired property at the foot of Ward Street, and a large new power house is now in course of construction.

ERIE, PA.—Union Iron Works, Cascade and Sixteenth Streets, will build a new one-story power house and boiler room, about 58x90 feet, to cost about $15,000. Constable Brothers, Fifth and Sassafras Streets, Erie, have the contract for construction.

HARRISBURG, PA.—Harrisburg Railway Company has awarded a contract to the Central Construction Company, 222 Market Street, Harrisburg, for the construction of a new one-story substation, about 32x43 feet, at Marion and Reily Streets.

LEMOYNE, PA.—Pennsylvania Railroad Company is installing two new high powered flood lights on the Cumberland Valley railroad bridge.

McKEES ROCKS, PA. — Pittsburgh Railways Company has had plans prepared for the construction of a new substation at Island Avenue and Boquet Street.

PHILADELPHIA, PA. — Pennsylvania Chemical Company has awarded a contract for the construction of a new one-story brick engine room, about 46x48 feet, at its plant at 1332 Washington Avenue, to cost $20,000. The Nickson-Duggan Corporation, Bailey Building, Philadelphia, is the contractor.

READING, PA.—Metropolitan Edison Company is installing a new 1500-kilowatt rotary, to be used principally for railway work, in its Seventh Street substation. A new booster set for voltage control is also being installed. The company has been awarded a contract by the Narrow Fabric Works to supply service to its plant at Wyomissing. A load of about 150 horsepower will be required.

WARREN, PA.—The Pennsylvania Gas Company has awarded a contract for the construction of a new two-story meter building, about 28x56 feet, to cost $12,000. Gibson & King, Warren, are the contractors.

WASHINGTON, D. C.—Potomac Electric Power Company, Fourteenth and C Streets, N. W., is planning the construction of a new power house on Benning Road, N. E., to cost about $40,000.

NORFOLK, VA.—Virginia Railway & Power Company is planning the construction of a new one-story brick and concrete substation.

RICHMOND, VA.—City awarded a contract to P. G. White & Sons, Merchants Bank Building, Richmond, for the construction of a one-story addition to the municipal electric-lighting plant to cost about $10,000. E. W. Trafford, engineer and superintendent of the plant.

SPRINGFIELD, VA.—Engineer C. A. Mess, of Charlotte, N. C., is preparing estimates for developing the waterpower of Springwood. Estimated capacity to be 600 horsepower at 24 hours daily for three months of the year, and 3000 to 4000 horsepower for nine months of 60 hours per week. Address Jasper Miller, Charlotte.

BLUEFIELD, W. VA. — Appalachian Power Company has awarded a contract to C. W. Hancock & Son, Lynchburg, Va., for the construction of a new electric generating station on the New River, to cost about $900,000. The plant will be steam driven, and have a capacity of 100,000 kilowatts.

REIDSVILLE, N. C.—Town Commissioners ordered meeting in October to vote on the sale of the municipal electric light plant to the Southern Public Utilities Company, Raleigh, for a consideration of about $30,000.

NORTH CENTRAL STATES.

CARDINGTON, O.—Cardington Electric Light, Heat & Power Co. has increased its capital from $15,000 to $20,000.

CLEVELAND, O.—Cleveland, Alliance & Mahoning Valley Railway has applied for

Business is Good

It is our opinion that the present market is stable and will remain so for the immediate future, without marked fluctuation in either direction. Our volume of business for the first eight months of 1917 was fully up to anticipations.—C. P. Lashelle, W. R. Ostrander & Company.

authority to issue $200,000 additional bonds to pay for improvements and betterments.

ELYRIA, O.—Elyria Telephone Company is increasing its capital from $200,000 to $350,000. The company is planning to establish a new automatic telephone system and will erect a substantial modern business building on Second Street.

ELKHART, IND.—Wakarusa Telephone Company has sold its exchange to the Home County Telephone Company.

MOUNT VERNON, IND.—Mount Vernon Electric Light & Power Company has increased its capital from $5,000 to $100,000.

ORANGEVILLE, IND. (R. F. D. Orleans)—Orangeville may have electric lights and a system of waterworks. If plans are adopted the power will be obtained by constructing a huge dam near the mouth of Lost river, where there is apparently an unlimited supply of water.

VALPARAISO, IND.—Lines operating under title Gary & Interurban, which have been in receivers' hands for a year, were sold recently to stockholders and to eastern interests.

EAGLE, WIS.—Eagle has installed electric lights.

MAPLETON, WIS.—Badger Telephone Exchange is receiving bids for a telegraph exchange, flat and garage.

STEVENS POINT, WIS.—Council recently decided on improved new system of street lighting.

CHISHOLD, MINN.—Excavation work for the foundation of a two-story brick and concrete power plant for the Minnesota Utilities Company has been started. The foundation will be 70x90 feet and equipment of plant will consist of a 1000-horsepower boiler with automatic stokers, which will develop steam to drive a 2000-kilowatt electric turbine and auxiliary engine. It is estimated $150,000 will be spent in improvements.

DONNELLY, MINN.—Bond issue of $14,000 for a municipal electric lighting system and power plant is under consideration.

FORT DODGE, IA.—October 15 an election will be held to decide question of granting franchise to Fort Dodge Gas & Electric Company for an electric lighting system.

SAC CITY, IA.—Bond issue for the installation of an electric light and power plant of $60,000 carried.

SUTHERLAND, IA.—Sutherland Telephone Company is having plans prepared for a telephone building to cost $25,000. H. L. Eddington, manager.

COLUMBUS, MO.—A movement to construct a telephone line from Columbus to Picher, with a central station at Picher, was taken up by the Columbus Commercial Club Sept. 10th. The club plans to have a direct line established.

KANSAS CITY, MO.—Kansas City Railroad Company, Fifteenth and Grand Avenues, has had plans prepared for the construction of a new two-story and basement substation, about 41x124 feet, at Thirty-first and Montgall Streets, to cost about $30,000. Keene & Simpson, Reliance Building, are the architects.

SPRINGFIELD, MO.—The extension of the White Way on West Walnut street, from Campbell to Market streets, will be started within the next few days. The expense of installation will be borne by business men and residents in the block. Plans are also under way to extend the line of lights east on Walnut street from Jefferson street for a distance of about 100 feet.

ST. LOUIS, MO.—Sealed bids will be received at the office of the Supply Commissioner up to 12 o'clock noon, September 21, 1917, for one sluice gate as per requisition No. 1560 on file in that office. Joseph B. Thomas, supply commissioner.

NORWAY, KANS.—Concordia Electric Light Company has asked permission to light the streets and houses of Norway.

DUNBAR, NEB.—Bonds amounting to $7,000 have been voted to establish an electric lighting system.

FENDER, NEB.—Proposition to issue $16,500 bonds for an electric lighting plant carried.

YORK, NEB.—Public Service Company is making improvements at its plant to take care of increasing business. Among additions is an engine.

MINOT, N. D.—A 150-horsepower motor has been added to the pumping equipment of Minot, to serve the northwest section of the city. Electric energy is supplied by the Northern States Power Company.

DATES AHEAD.

American Electrochemical Society. Annual convention, Pittsburgh, Pa., October 3 to 6. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

National Electrical Contractors' Association of the United States. Annual convention, New Orleans, La., October 10 to 13. Secretary, H. C. Brown, Utica, N. Y.

The Jovian Order. Annual convention, Hotel McAlpin, New York City, October 22-23. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electrical Committee, National Fire Protection Association. Adjourned annual meeting, New York City, October 23-24. Secretary, Ralph Sweetland, 141 Milk Street, Boston, Mass.

National Electric Light Associaiton, Southeastern Section. Annual convention, Birmingham, Ala., October 24 to 26. Secretary, T. W. Peters, Columbus, Ga.

SOUTH CENTRAL STATES.

COVINGTON, KY.—A new electric light company is being organized to bid on the light franchise recently passed by the council.

BRISTOL, TENN.—Bristol Traction Company's properties, including 15 miles of electrified track and all equipment, pavilions and franchises, were sold recently to satisfy bonds amounting to $165,000 and a delinquency in operating costs. B. L. Dulaney and associates bought the properties for $70,000. Rehabilitation of the system will be considered.

BEAVER CITY, OKLA.—City will issue $8,000 bonds to construct electric lighting plant.

MIAMI, OKLA.—City approved report planning $150,000 expenditure for electric lighting plant and waterworks improvements.

QUAPAW, OKLA.—City plans the installation of an electric lighting system.

TAHLEQUAH, OKLA.—Tahlequah Light & Power Company will improve its power plant. E. S. Billings, chief engineer.

DALLAS, TEX.—Electrical interests represented by C. W. Hobson and J. F. Strickland, which were granted franchises for the consolidation of the various properties here under certain conditions, have asked to be relieved temporarily of that stipulation which requires the construction of an interurban line to run "30 miles from some outside point into Dallas." The outside terminus of this proposed road was Terrell. These interests also asked to be relieved of the clause in the franchise which requires the expenditure of large additional sums of money for extensions and improvements.

DALLAS, TEX.—Dallas Southwestern Traction Company has been granted a franchise to build an interurban electric railway between this city and Irving. It is stated by E. P. Turner, president of the company, that construction of the line will begin soon and that the first eight miles will be finished and in operation in eight months. The construction work, once in progress, will be continued until the road reaches Cleburne, a distance of 60 miles. The same interests comprise the Northwestern Traction Company, which plans to build an interurban electric line between Dallas and Denton, a distance of 30 miles. It is stated that the construction of this line will also be started soon. Contract for the construction work of the Dallas line has been awarded to the Creek Construction Company, Sapulpa, Okla., with John T. Witt, chief engineer.

GALVESTON, TEX.—According to a supplemental contract which has just been entered into between the Larkin & Sangster Company and the Gulf, Colorado & Santa Fe, the Galveston, Henderson & Houston and the Galveston, Harrisburg & San Antonio Railroad companies and the Galveston-Houston Electric Railway Company, the railroads named are to bear 45 per cent of the cost of constructing the destroyed portions of the causeway which spans Galveston Bay, the Galveston-Houston Electric Railway Company 22 per cent and the county of Galveston the remaining 33 per cent. In its supplemental contract the Galveston, Houston & San Antonio acted in its own behalf and in behalf of the county of Galveston. The total cost of the proposed work will be about $1,500,000.

WESTERN STATES.

HELENA, MONT.—Residents on Ewing street, Sixth, Seventh, Eighth, Ninth and Tenth avenues have petitioned for formation of special district for street lighting.

MISSOULA, MONT.—An electric road between this place and Polson is contemplated and Col. A. A. White, formerly chief engineer of the Great Northern Railway, will make a survey for same.

TROY, MONT.—Council has granted franchise to William B. McDonald to install an electric lighting plant.

LA JUNTA, COLO.—Arkansas Valley Railway, Light & Power Company has been granted a renewal franchise by La Junta for electric light and power. This action ends an agitation for a municipally-owned electric lighting plant, which resulted two and one-half years ago in a popular vote for a bond issue for this purpose. The bond issue carried by the narrow margin of 11 votes. Subsequently the Public Utilities Commission of Colorado investigated the company's rate charges in La Junta and made certain reductions in the schedule. The rates as then revised will remain in effect under the new franchise.

NOGALES, ARIZ.—Mountain States Telephone & Telegraph Company will begin work on a new building.

OATMAN, ARIZ.—A power line will be run to the gold ore mine at this place and complete electrical equipment will be installed.

TUCSON, ARIZ.—Cornelia Copper Mining Company has contracted with the Southern Sierras Power Company for 2000 kilowatts of electric current to be delivered at the company's mine at Ajo. The line connecting with the main line at Yuma is to be completed within 18 months.

AMERICAN FALLS, IDA.—Ida Power Company has awarded contract for construction of new 5000-horsepower station and closing of breach in dam to Sam Porter at $50,000. The new unit will practically double power now being generated.

ANACORTES, WASH.—Citizens have petitioned council to furnish lights for street lighting.

OROVILLE, WASH.—Okanogan Valley Power Company has applied for an electric lighting franchise in this place. The question has been set for hearing on October 2.

SEATTLE, WASH.—Councilman O. T. Erickson has introduced bill specifying and adopting a system for an extension of municipal street railway system. Bill authorizes construction of an elevated street railway on Railroad, Whatcom, Washington and Spokane avenue, from First avenue south to the West Waterway. It is planned to have the city acquire running rights on a number of avenues to Stewart street for a connection with Division A, which the council has decided to extend into Ballard and through Ballard to the north city limits at a cost of about $100,000. The elevated portion of the line will cost about $350,000.

SEATTLE, WASH.—Gray & Barash, electrical engineers and contractors, will erect a one-story 30x100-foot warehouse at 63 Horton street to cost $4,000.

SEATTLE, WASH.—H. H. Travers, Arcade building, was awarded contract for making extension to Division A of the Municipal street railway at $19,544.

WHITE SALMON, WASH.—Northwestern Electric Company has plans under way for construction of another large power plant on White Salmon river, between the present power house and Underwood. It is estimated the new plant will cost $400,000.

EUGENE, ORE.—C. O. Peterson and E. Kopke will spend several thousand dollars on the Eugene mill race to give more power and protect the stream from freshets.

PORTLAND, ORE.—Northwestern Electric Company is contemplating further water-power development on White Salmon river. The company owns two power sites in addition to the one now occupied by the plant, about two miles above the mouth of the White Salmon river, in Washington. The improvements it is estimated will cost $400,000. W. E. Coman, president.

THE DALLES, ORE.—Malcom Moody has plans drawn for construction of a large dam and power house on the Deschutes river.

EUREKA, CAL.—Arrangements have been completed whereby the Eureka division of the Western States Gas & Electric Company will secure 1000-kilowatts of hydro-electric energy from the Northern California Power Company. This enables the Western States Company to shut down a stream generating plant.

LIVINGSTON, CAL.—Ways and means are under consideration to improve the street lighting. Address secretary of Board of Trade.

LOS ANGELES, CAL.—California Supreme Court in the case of the Silver Lake Power & Irrigation Company vs. The City of Los Angeles regarding the use of waters of Owens river along a stretch of 15 miles, has decided in favor of the city. The court held that, notwithstanding the prior work done by the company, Congress under the Constitution had the sole power over the public domain and could, as it did, grant the lands and rights in question to the city of Los Angeles. It was further held that the company and others seeking to appropriate the public domain are presumed to act with the knowledge that Congress may dispose of the property in some other way if it so decides.

OAKDALE, CAL.—Pacific Telephone & Telegraph Company will put in a new line between this place and Hodesto, Cal.

OLINDA, CAL.—Engineer Thomas B. Means will prepare estimates for irrigation work contracted for by the directors of the Happy Valley Irrigation District. A $100,000 bond issue is proposed.

REDLANDS, CAL. — Pacific Electric Railway Company has selected a route for a line from Redlands to the Yucaipa Valley and will begin construction work soon.

RIVERSIDE, CAL.—Board of Public Utilities has passed ordinances approving the lighting systems proposed for Jurupa avenue, Eleventh and Mulberry streets.

SAN DIEGO, CAL.—San Diego Consolidated Gas & Electric Company has been authorized to serve the towns of Escondido, Fallbrook, Oceanside and in San Diego County.

SAN FRANCISCO, CAL. — Board of Public Works has called for bids for installing electrical yard work in connection with the northeasterly wing of the San Francisco Hospital.

SAN FRANCISCO, CAL.—Bureau of Architecture estimates that the completion of the lighting system for the San Francisco Civic Center will cost approximately $30,000.

SAN FRANCISCO, CAL.—Great Western Power Company is enlarging its right-of-way from its hydro-electric plant at Big Meadows in the Sierra Nevada Mountains to San Francisco Bay, preliminary to the construction of another power line paralleling the present line.

SAN FRANCISCO, CAL.—Oakland, Antioc and Eastern (electric) Railway Company has been authorized to issue $435,553 in short term notes to banks in San Francisco and Sacramento.

SAN FRANCISCO, CAL.—Pacific Gas & Electric Company and the Amador Electric Light & Power Company have applied for permission for a transfer from the former to the latter of a 2400-volt electric line, a quarter of a mile long.

SAN RAFAEL, CAL.—Council has called for bids for the telephone franchise applied for by Pacific Telephone & Telegraph Company.

SANTA ANA, CAL.—An election will be held October 11 to decide on the formation of the proposed Tustin lighting district in Orange County.

SANTA ANA, CAL.—Pacific Electric Railway Company has been granted a 50-year franchise for an electric railway along certain public roads in Orange County.

TAFT, CAL.—San Joaquin Light & Power Company is building seven miles of line to supply the Reward and Union oil companies in the canarris neighborhood.

TROPICO, CAL.—Pacific Telephone & Telegraph Company has let contract for the erection of a building here to cost $46,000.

INCORPORATIONS

DOVER, DEL.—M. V. All Weather Train Controller Company. Capital, $2,000,000. To manufacture electric signals for trains. Incorporators: F. A. Armstrong, C. L. Rimlinger, Wilmington; and C. M. Egner, Elkton, Md.

DES MOINES, IA.—Xcelo-O-Lyte Company has incorporated with a capital of $20,000 and will manufacture and sell electric lighting systems for automobiles. C. W. Lyon is president and E. C. Peters general manager.

GRAND RAPIDS, MICH. — Electric Service & Power Equipment Company. Capital $11,000. Incorporators: William G. Brummeler, Joseph Brown and D. R. McDuffee.

CARDWELL, MO.—Marwell Electric Light & Power Company of Arkansas has filed articles of incorporation.

LEWISTOWN, MONT. — Stanford & Northern Telephone Company. Capital, $10,000. Incorporators: N. K. Christenson, L. E. Black and O. S. Brooks.

NEWARK, N. J.—David Electric Company. Capital, $50,000. To engage in a general electrical supplies business. Incorporators: R. Van Seggeren and C. E. Davis, Newark; and A. E. David, Irvington.

NEW YORK, N. Y.—Vico Supply Company, Inc. Capital, $10.000. To engage in a general electrical supply business. Incorporators: G. A. Paine, W. H. Vidor and H. Brill, 550 West 158th street.

SYRACUSE, N. Y.—Rochester & Syracuse Railroad Company. Capital, $4,500,000. To operate and maintain a railroad. Incorporators: M. V. White, A. W. Loasby and D. Settle, Syracuse.

CHARLOTTE, N. C.—Charlotte Telephone Company. Capital $5,000. D. D. Lester, Jr., president.

CARROLTON, OHIO.—Canton & Ohio River Railway Company is being organized with a capital of $1,000,000, to promote the construction of an electric railway from Canton to Wheeling, W. Va. The company is being formed under the laws of Ohio and West Virginia, with Canton, Cincinnati and Cleveland men as backers.

COLUMBIA, S. C.—Antreville Telephone Company. To operate and maintain a local telephone exchange. Incorporators: R. A. Keaton and Frank A. Carwell, Columbia.

SEATTLE, WASH.—Johnson Power Transmission Company. Capital, $2,000. Incorporators: W. A. Blackwood, J. D. Johnson and Adair Rembert.

PROPOSALS

PUMPS AND CAPSTANS.—Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids on the following equipment: Four complete electric capstans, for delivery at Philadelphia navy yard, schedule 1486; four 15-inch motor-driven centrifugal pumps, for delivery at Philadelphia navy yard, schedule 1487.

ELECTRIC LIGHT CABLE.—William G. Keith, commissioner gas and electricity, 614 City Hall, Chicago, will receive bids until October 2 for furnishing and delivering to the City of Chicago, Department of Gas and Electricity, the following materials, to be strictly in accordance with specifications on file in his office: 3 conductor, 12,000-volt paper insulated lead covered cable and about 70,000 feet of from 4/0 to 2 inclusive.

DISTRIBUTION TRANSFORMERS.—Board of Public Words, Seattle, Wash., will receive bids until October 5 for approximately 450 distributing transformers for the lighting department.

CENTRIFUGAL PUMPS AND ACCESSORIES.—Frank I. Bennett, Commissioner of Public Works, 406 City Hall, Chicago, will receive bids until October 16 for furnishing and providing all tools, material, labor and constructing, delivering and completely erecting two motor-driven centrifugal pumps, with auxiliaries, appurtenances and accessories, at the Chicago Avenue Pumping Station, located at 811 Lincoln Parkway, Chicago. The material must be strictly in accordance with plans and specifications on file in his office

ELECTRIC LIGHTING PLANT.—Bids will soon be received at Magee, Miss., for installing electric lighting plant for Mississippi State Tuberculosis Sanatorium. Address Ben Price, 518-519 Empire building, Birmingham, Ala.

MAZDA LAMPS.—A. C. Riddell, Purchasing Agent, Kansas City, Kans., will receive sealed bids at his office in the City Hall until 10 a. m., October 2, for lamp contract for Mazda lamps. Bidders are requested to make their proposals on a basis of $2,500 lamp purchase during the year. Each proposal must be accompanied by cash or certified check for $50.

NEW PUBLICATIONS

TELEPHONIC TRANSMISSION LOSSES.—The Electrotechnical Laboratory of the Imperial Department of Communications, Tokyo, Japan, has issued an English reprint of the research on "Telephonic Transmission Losses of Bridged Impedances, Series Resistances and Capacitances," by K. Ogawa and T. Arakawa. Accompanying the publication are numerous curve sheets and data.

Electrical Patents Issued September 18, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,240,176. **Automobile Indicator.** H. Claude, Clarkstown, Ottawa, and O. Lacombe, Ottawa, Ontario, Canada. Direction indicator mounted on the radiator cap.

1,240,184. **Electric Railroad.** T. M. Erickson, Chicago, Ill. Electromagnetic device for operating a track switch from a car.

1,240,186. **Spring Terminal Connection.** E. B. Fahnstock, Brooklyn, N. Y. For connecting the ends of conductors.

1,240,188. **Electrical Conduit Bushing.** C. W. Finley, Battle Creek, Mich. For connecting a conduit with a junction box.

1,240,206. **Oscillation-Generator.** R. A. Heising, assignor to Western Electric Co., New York, N. Y. For wireless transmission.

1,240,213. **Artificial Line.** R. S. Hoyt, assignor to American Telephone & Telegraph Co., New York, N. Y. For simulating the characteristic impendance of a cable circuit having uniformly distributed constants.

1,240,222. **Tripping Device.** C. B. King, B. Jacoby and C. S. Johnson, assignors, to Marion Steam Shovel Co., Marion, Ohio. For controlling the closure of an excavator dipper.

1,240,239. **Battery-Case.** M. H. Moffett, assignor to National Carbon Co., Inc., Cleveland, Ohio. Combination shipping case and holder for dry batteries.

1,240,257. **Telephone System.** F. N. Reeves and A. E. Lundell, assignors to Western Electric Co. Combination with a connector switch of means for selective ringing on a party line.

1,240,263. **Overhead-Trolley Suspension and Feed-in Ear.** J. Scott, Cleveland, Ohio. Structural details.

1,240,280. Storage Battery. D. H. Wilson, Paterson, N. J. Non-porous, high resistance plates have low resistance inserts, and low resistance conductors on the bus bars, to equalize the resistance of the current paths between the plates of opposite polarity.

1,240,282. Headlight. O. Winston, Minneapolis, Minn. Reflector may be oscillated by electromagnets.

1,240,283. Dimmer-Light-Switch Support. L. L. Winters, Monroe, Mich. Structure of bracket.

1,240,294. System of Generating High-Frequency Currents. R. Arno, Milan, Italy. A low number of phases of low tension are transformed by a static transformer into multiple phases of high frequency which are supplied to a jigger associated with an aerial.

1,240,306. Telegraphy. W. M. Bruce, assignor to United Telegraph & Cable Co., Springfield, Ohio. Structure of movable coil relay.

1,240,309. Switch. G. C. Carhart and S. L. Young, assignors to Syracuse Universal Mfg. Co., Syracuse, N. Y. Operated by a removable key.

1,240,314. Oil Switch. H. W. Cheney, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Relates to the switch structure and manner of associating a number of switches with operating mechanism.

1,240,328. Method and Apparatus for Locating Ore-Bodies. R. A. Fessenden, assignor to Submarine Signal Co., Waterville, Me. Sound waves are electrically generated and their inflection observed.

1,240,330. Insulator and Support Therefor. L. Fort, Jersey City, N. J. Two-part insulator of the petticoat type and bracket therefor.

1,240,348. Engine-Starting Device. C. F. Kettering, assignor to Dayton Engineering Laboratories Co. Starting machine has motor winding for starting from accumulator at high torque and generator winding for charging the accumulator at low potential.

1,240,351. Vibrating Mechanism. F. B. Little, assignor to J. C. Deagan Musical Bells, Chicago, Ill. Contact-key controlled electromagnetic mechanism for operating a hammer for musical instruments.

1,240,358. Compound Trolley Wheel. T. C. Ollard, assignor to Ollard Trolley Wheel Co., Dover, Del. Structural details.

1,240,363. Meter-Testing-Switch Construction. C. D. Platt, Bridgeport, Conn. Structural details.

1,240,364. Inclosed-Switch Construction. C. D. Platt, Bridgeport, Conn. Structure of casing for fused switch.

1,240,380. Traffic Directing Signal for Vehicles. C. A. Singer, assignor to Singer Auto Traffic Signal Co., St. Louis, Mo. Has an electromagnetically operated set of indicators.

1,240,410. Electrical Massage Apparatus. T. Bollin, Okmulgee, Okla. Details of cabinet and electrodes.

1,240,418. Telephone System. L. C. Bygrave, assignor to Relay Automatic Telephone Co., Ltd., London, England. Relates to selection of the exchange by calling impulses.

1,240,442. Circuit-Breaker. W. S. Harley, assignor to Harley-Davidson Motor Co., Milwaukee, Wis. Controlled by the vacuum in the intake pipe of an internal combustion engine.

1,240,448. Implement for Winding Armatures. W. T. Hensley, assignor to Bound Brook Engine & Mfg. Co., Boundbrook, N. J. Winding machine for handling a number of wires.

1,240,449. Electrically-Heated Valve. C. J. Hinshaw and R. L. Gable, Shelbyville, Ind. Manner of connecting with a heater in the valve chamber.

1,240,452. Floodlight-Projector. P. M. Hotchkin, Chicago, Ill. Structure of housing.

1,240,457. Electric Resistance Device. W. H. Keller, Norton, Va. Special insulation and mounting of grids.

1,240,458. Signal-Lamp. H. S. Kittredge, assignor one-half to H. A. Anderson, Chicago, Ill., and one-half to F. D. A. Hunter, Fort Wayne, Ind. Structure of rotary circuit controller.

1,240,459. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Snap switch for concealed mounting.

1,240,460. Electric Furnace. D. R. Knapp, assignor to Eastern Steel Co., Pottsville, Pa. Of the induction type.

1,240,471. Electromagnetic Device. D. D. Miller, assignor to Western Electric Co. Slow responding and releasing relay.

1,240,496. Composition Containing Alumina and Zirconia. L. E. Saunders and R. H. White, assignors to Norton Co., Worcester, Mass. Electric furnace abrasive.

1,240,491. Aluminous Abrasive and Method of Preparing the Same. L. E. Saunders and R. H. White, assignors to Norton Co. Modification of above.

1,240,505. Lighting-Fixture. E. M. Smith, assignor one-half to L. Plaut and one-half to H. Plaut, New York, N. Y. Combined shade and bowl for incandescent lamps.

1,240,535. Device for Automatically Controlling Lighting-Gas Conduits, Electric Circuits, and the Like. A. C. A. Bouchard, Nice, France. Clock work apparatus.

1,240,559. Electropneumatic Channeling-Machine. A. H. Gibson, assignor to Ingersoll-Rand Co., New York, N. Y. Pulsator operated percussive tool.

1,240,565, 1,240,566 and 1,240,567. Insulating Compound and the Method of Forming the Same. J. W. Harris, assignor to Western Electric Co. Different compounds comprising resin and castor oil subjected to destructive distillation.

1,240,574. Current-Jack for Electrical Meters. F. R. Innes, Detroit, Mich. Jack for making connections for meter testing.

1,240,583. Headlight for Motor-Vehicles, Etc. H. W. Lakin, Boston, Mass. Structure of incandescent lamp, casing and reflectors.

1,240,584. Articulated Metal Shell for an Electric Hot-Pad. H. D. Laraway and B. Falkenberg, assignors to Hotpoint Electric Heating Co., Ontario, Cal. Sheet metal structure for enclosing a heating element.

1,240,585. Brush-Mounting for Electric Motors or Generators. T. L. Lee, assignor to North East Electric Co., Rochester, N. Y. Structural details.

1,240,590. Governor for Regulating the Over-Charge for Storage Batteries. P. Okey, assignor to Lalley Electro-Lighting Corp., Detroit, Mich. Full charge is governed by ampere hour meter which is arranged to permit over charging after a certain number of full charges.

1,240,615. High-Tension Magneto. J. R. Stark, assignor to Webster Electric Co., Racine, Wis. Arrangement of rotary contacts for connecting secondary coil of armature in the ignition circuit and for periodically grounding the contacts.

1,240,623. Motor-Control System. C. P. Taylor, assignor to General Electric Co., Schenectady, N. Y. Relates to dynamic braking of reversible direct current motor.

1,240,628. Arc-Light Electrode. K. Tornberg, assignor to General Electric Co. Comprises exothermic reaction product of a compound which liberates oxygen when heating and a light giving material combining with the oxygen.

1,240,637. Advertising-Kiosk. G. W. Williamson, Petaluma, Cal. Motor operated solenoid controlled rotary structure with changeable panels.

1,240,644. Lighting Unit. P. S. Bailey, assignor to General Electric Co. Structure of projector having adjustable reflector.

1,240,647. Electrical Signal E. Balbach, Springfield, Ohio. Solenoid operated rollers carrying sign band.

1,240,659. Telephone-Mountpiece. W. Booth, East Liverpool, Ohio. Structural details.

1,240,660. Insulated Rail-Joint. B. G. Braine, assignor to Rail Joint Co. Structural details.

1,240,700. Incandescent Tungsten Lamp. E. Friederich, assignor to General Electric Co. Barium chlorate evolves oxidizing atmosphere in the bulb which combines with the vaporizer tungsten to give a transparent compound.

1,240,707. Electric Lighter for Gas Stoves. F. C. Gutenberger, Sacramento, Cal. Portable electric spark device.

1,240,710. Power-Factor Meter. C. I. Hall, assignor to General Electric Co. Is operated by torques dependent upon the watt-energy and current flow respectively.

1,240,711. Talking-Machine. C. I. Hall, assignor to General Electric Co. Disc support is provided with peripherial copper band acted on by electro-magnets to drive the support inductively.

1,240,721. Auxiliary Spark-Cap. F. F. Hultgreen, Berkeley, Cal. For spark plugs.

1,240,723. Time-Limit Relay. E. H. Jacobs, assignor to General Electric Co. A definite time limit mechanism set in operation by circuit conditions moves tripping armature closer to winding engized according to circuit condition.

1,240,724 and 1,240,725. Engine Appliance. J. W. Jepson, assignor to Gould Coupler Co. Ignition, lighting and starting systems.

1,240,726. Engine-Starting Arrangement. J. W. Jepson, assignor to Gould Coupler Co. Starting motor has its field automatically weakened as the load decreases.

1,240,738. Brush-Mounting. E. P. Lee and T. L. Lee, assignors to North East Electric Co., Rochester, N. Y. Has a sheet metal supporting ring.

1,240,744. Automatic Train-Stopping Apparatus. A. Longhed, Georgetown, Conn. Block system.

1,240,763. System for Recording the Condition of Apparatus. A. Nicol, assignor to General Electric Co. For recording the conditions of actuators of secondary clocks, controlled by a master clock.

1,240,770. Electric-Light Apparatus. N. Papa, Utica, N. Y. Light in combination with a motor shunted thereabouts and switches for continuously or intermittently operating the light.

1,240,771. Electric Heating Unit. L. F. Parkhurst, assignor to General Electric Co. Structure and manner of mounting insulated metal sheet resistance wire in a frame.

1,240,772. Vapor Electric Device. H. F. Perkins, assignor to General Electric Co. Insulation and mounting of vaporizing cathode.

Reissues.

14,362. Insulated Rail-Joint. P. G. Ten Eyck, assignor to Rail Joint Co. Structural details.

Note as to Patent List.—In the list of electrical patents appearing on pages 534 and 535 of the September 22 issue of the Electrical Review, the patents numbered from 1,239,443 to 1,240,076, inclusive, were granted on September 11, 1917, instead of September 4 as the title indicated. The list as published contained the patents of September 4 and 11, but the latter date was inadvertently omitted.

Patents Expired.

The following United States electrical patents expired on September 25, 1917:

658,336. Electric Railway. E. M. Bentley, New York, N. Y.

658,388. Mechanism for Imparting Successive or Alternating Movements. E. Moore, Meductic, Canada.

658,412. Method of Treating Ores. G. M. Westman New York, N. Y.

658,431. Dynamo Brush. C. Endruweit, Berlin, Germany.

658,445. Electric Car. A. A. Ingraham, Lowell, Mass.

658,476. Dynamo Regulation. I. E. Storey, Trenton, N. Y.

658,483. Process of Oxidizing Negative Electrodes for Primary Batteries. C. J. Coleman, Chicago, Ill.

658,536. Apparatus for Treating Ores. G. M. Westman, New York, N. Y.

658,539. Means for Raising Pile or Nap on Fabrics. W. H. Baker, Central Falls, R. I., and F. E. Kip, Montclair, N. J.

658,601. Appliance for Imparting Heat and Electricity to the Body. I. Timar, Berlin, Germany.

658,607. Projecting Apparatus. F. J. Adams, New York, N. Y.

658,612. Telephone Directory. W. J. Bell, Baraboo, Wis.

658,664. Thermostat. W. E. Mack, Oswego, N. Y.

658,698. Electric Furnace. C. S. Bradley, New York, N. Y.

658,706. Electric Stove. H. J. Dowsing, London, England.

658,733 and 658,734. Secondary Battery. C. J. Coleman, Chicago, Ill.

658,739. Coin-Setting Electric Meter. F. Kraemer, Chicago, Ill.

658,741. Electric Welding Machine. O. Parpart, Cleveland, O.

REISSUE 11857. Phonograph. T. A. Edison, Llewellyn Park, N. J.

Financial News and Comment

According to published reports the Gary and Interurban Steel Railway System, sold at receivers' sale at Crown Point recently to the bondholders, will be taken over by the Insull Traction Syndicate in Chicago, which operates the Hammond, Whiting and East Chicago Street Railway Company in this territory. Both lines own joint pole and trackage rights in East Chicago, and the absorption of one by the other will be a big stimulant to street railway business.

The market for public utilities securities last week saw a decided change for the better. Nothing appeared early to indicate more than a continuation of the movement to lower levels which had been going on for several weeks, but in the last few days the usual market leaders were well supported and later regained a part of their recent losses. Traders reported that enough outside buying has again developed to indicate that the bottom prices have been reached.

In well informed circles it is said that the lower prices and the little apparent support lately were due to the fact that the general uncertainties caused public utilities to be practically neglected and allowed to seek their own level. A better market is anticipated, with several issues regaining a good part of their recent losses.

American Light and Traction common have held close to 258 bid and 260 asked, a substantial gain, with the preferred remaining unchanged at 103 bid and 106 asked. Cities Service common at 237 bid and 241 asked was in better shape. Pacific Gas and Electric common was higher at 46 bid and 48 asked. Republic Railway and Light preferred was quoted higher. United Light and Railways common sold between 36 and 38.

Declines were registered lately by American Gas and Electric common at 108 bid and 111 asked and American Power and Light common. In neither case was the loss substantial.

Public Service Railway Company, New Jersey, will increase wages of its motormen and conductors, beginning October 1. The announcement came as a surprise to the men. The new scale of wages starts at 28 cents an hour, instead of 25 cents, and increases the maximum rate of pay from 32 to 34 cents, with like increases for the intermediate steps. Overtime work will be paid for at the rate of 40 cents an hour. The increases will add about $300 000 a year to the company's payroll. The last previous raise in wages was made by the company in July, 1916.

A. H. M. Byllesby & Company's recent news bulletin contains the following:

The company holds an exceptional position in regard to fuel supply. Practically all of the electricity supplied by the company is generated by water power, much of it in the company's own water developments; and that which is not is purchased from other hydro-electric stations under long term contracts, and fifty-five per cent of the company's gas supply at Stockton is produced from natural gas wells owned by the company. Among the interesting developments in the use of electric power in this territory has been its application for steel reduction by electric furnaces, which is both profitable and highly desirable from the company's standpoint. Two such installations are now being operated in Stockton, one with a capacity of one ton of steel, and one with a capacity of ¾ ton; and a contract has recently been secured by the company covering a six-ton furnace of this character to be operated by the Samson Sieve-Grip Tractor Company.

Stock of the new Lehigh Power Securities Corporation, when issued, will be deposited under a voting trust agreement. Temporary voting trust certificates are now being issued. The following are to be voting trustees: Irving W. Bonbright of Bonbright & Company, Inc., George H. Frazier of Brown Bros. & Company, S. Z. Mitchell, president of the Electric Bond & Share Company, Lewis E. Pierson, president of Austin, Nichols & Company, S. D. Warriner, president of Lehigh Coal & Navigation Company, G. M. Dahl, vice-president Chase National Bank, New York, Alexander J. Hemphill, chairman Guaranty Trust Company, New York, Thomas Newhall of Edward B. Smith & Company, Daniel E. Pomercy, vice-president of Bankers' Trust Company, New York, and William West of Henry & West.

Public Utility Dividends.

Middle West Utilities Company, Chicago, declared semi-annual dividends of 1 per cent in cash and 1 per cent in common stock on the common stock for the half year ended August 15, payable October 1 to stock of record September 15.

United Light & Railways, Chicago, declared regular quarterly dividends of 1½ per cent on (first) preferred and 1 per cent on common, payable October 1 to stock of record September 1.

Duluth-Superior Traction Company declared the regular quarterly dividends of 1 per cent upon the common and preferred stocks, both payable October 1 to stock of record September 15.

Springfield Railway & Light Company declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable October 1 to stock of record September 15.

The Ottawa Traction Company declared regular quarterly dividend of 1 per cent on capital stock, payable October 1 to stock of record September 15.

Buffalo General Electric Company has declared the regular quarterly dividend of 1¾ per cent on the common stock, payable September 29 to stock of record September 20.

United Traction & Electric Company declared the regular quarterly dividend of 1¼ per cent on the capital stock, payable October 1, to stock of record September 11.

Southern Utilities Company has declared the regular quarterly dividend of $1.75 a share on the preferred stock, payable October 1 to stock of record September 18.

Consumers Power Company, a subsidiary of Commonwealth Power, Railway & Light Co., declared regular quarterly dividend of 1½% on the preferred stock, payable October 1 to stock of record September 20.

Republic Railway & Light Company declared the regular quarterly dividend of 1½% on the preferred stock, and 1% on the common stock, payable October 15 to stock of record September 29.

The Arkansas Light & Power Company has declared the regular quarterly dividend of 1¾% on the preferred stock, payable October 1 to stock of record September 15.

National Fuel Gas Company declared the regular quarterly dividend of $2.50, payable October 15, to stock of record September 29.

Subsidiary companies of the United States Gas & Electric Corporation have declared dividends as follows: Colorado Springs Light, Heat & Power Company has declared the regular quarterly dividend of 1½% on the preferred stock, payable September 29 to stock of record September 17; Harrisburg Light & Power Company has declared the regular quarterly dividend of 1½% on the preferred, payable September 29, and a dividend of 2½% on the common stock, payable September 27. Stock of record date is September 17; Houston Gas & Fuel Company has declared the regular quarterly dividend of 1¾% on the preferred stock, payable September 30, and a dividend of ½ of 1% on the common stock, payable September 27. Stock of record date is September 17; Houston Heights Water & Light Association has declared a dividend of 1% on its capital stock, payable September 27 to stock of record September 17.

Cities Service Company has declared a regular monthly dividend of ½ of 1% on its common and preferred stock, payable in cash, and ½ of 1% in stock on the common stock, payable October 1 to stockholders of record September 15.

New England Telephone & Telegraph Company declared the regular quarterly dividend of $1.75 a share, payable Sept. 29 to stock of record Sept. 19.

Niagara Falls Power Company declared the regular quarterly dividend of $2, payable October 15 to stock of record September 29.

Washington Water Power Company declared the regular quarterly dividend of 1% on its capital stock, payable October 1 to stock of record September 15.

Granby Consolidated Mining, Smelting & Power Company has declared the regular quarterly dividend of 2½%, payable November 1 to stock of record October 19.

Detroit Edison Company declared the regular quarterly dividend of 2%, payable October 15 to stock of record Sept. 29.

The California Electric Generating Company has declared the regular quarterly dividend of 1½% on the preferred stock, payable October 1 to stock of record September 22.

REPORTS OF EARNINGS.

REPUBLIC RAILWAY & LIGHT CO.

Consolidated statement of earnings of Republic Railway & Light Company and subsidiary companies, inter-company items eliminated, for August and twelve months ended Aug. 31, 1917, as follows:

	1917.	1916.
August gross .....$	426,115	$ 335,578
Net after taxes	151,401	152,431
Sur. after charges...	73,167	87,931
Bal. after pfd. divs...	47,210	39,974
Twelve mos. gross...	4,444,722	3,748,883
Net after taxes	1,596,772	1,558,398
Sur. after charges...	701.591	794,181
Bal. after pfd. divs...	390,107	482,697

DAYTON POWER & LIGHT COMPANY.

Income account of Dayton Power & Light Company for August, eight and twelve months ended August 31, as follows:

	1917.	1916.
August gross .....$	135,193	$ 123,924
Net after taxes	40,517	44,641
Surp. after charges..	15,983	25,369
Bal. after pfd. div..	1,170	10,556
8 months' gross.....	1,163,357	1,011,019
Net after taxes	369,968	446,204
Surp. after charges.	172,876	302,330
Bal. after pfd. div...	54,376	185,642
12 months' gross....	1,766,211	1,440,304
Net after taxes	537,677	658,720
Surp. after charges.	255,113	446,177
Bal. after pfd. div...	77,363	284,896

CITIES SERVICE COMPANY.

Earnings of Cities Service Company for August and 12 months ended August 31, 1917, as follows:

	1917.	1916.
August gross .....$	1,366,659	$ 628,823
Net after taxes ...	1,335,850	604,322
Sur. after charges..	1,335,624	603,602
Bal. after pfd. div..	1,010,254	407,918
Twelve mos. gross..	17,296,943	7,149,948
Net after taxes ...	16,976,354	6,930,511
Surp. after chgs....	16,973,089	6.509.509
Bal. after pf. div...	13,550,718	4,599,123

PHILADELPHIA RAPID TRANSIT.

	1917.	1916.
August gross .....$	2,436,680	$2,149,836
Net	1,031,714	926,363
Surplus after chgs..	219,274	111,352
Two months' gross..	4,874,074	4,264,765
Net	2,039,683	1,919,817
Surplus after charges	415,862	289,538

MONTREAL TRAMWAYS COMPANY.

Earnings of Montreal Tramways for the year ended June 30 are as follows:

	1917.	1916.
Gross .....$	7,725,498	$6,609,765
Net after expenses....	3,123,727	2,902,712
Balance after charges.	875,003	784,307
Surplus after dividend	537,473	460,436
Transfer to g. surplus.	77,473	111,422

WESTERN POWER CORPORATION.

Gross and net earnings of the five companies comprising the Western Power system, for August, compare as follows:

	1917.	1916.
August gross	$ 331,825	$ 306,596
Net after taxes	209,828	191,515

DETROIT EDISON COMPANY.

Consolidated earnings of the Detroit Edison Company and subsidiary companies for August and eight months ended August 31, 1917, as follows:

	1917.	1916.
August gross	$ 901,576	$ 718,328
Net after taxes	205,443	213,852
Surp. after chgs.	117,670	127,410
8 mos.' gross	7,776,363	6,274,255
Net after taxes	2,387,844	2,312,632
Surplus after chgs.	1,705,897	1,593,446

VIRGINIA RAILWAY & POWER CO.

Earnings of Virginia Railway & Power Company for August and two months ended August 31, 1917, as follows:

	1917.	1916.
August gross	$ 592,903	$ 488,698
Net earnings	269,722	249,604
Surp. after taxes & other charges	119,847	110,742
Two mos.' gross	1,154,655	986,104
Net earnings	547,079	511,907
Surp. after taxes & other charges	249,388	233,827

WESTERN STATES GAS & ELECTRIC COMPANY.

Report of gross and net earnings for the Western States Gas & Electric Company for the month of August shows marked advance over earnings for the corresponding month of 1916. The figures in detail follow together with report of earnings for the year ended August 31, 1917 and 1916:

Month. of August.	1917.	1916.
Gross earnings	$ 116,849	$ 97,515
Net earnings	55,428	47,084
Year ended August 31:		
Gross earnings	1,340,331	1,218,887
Net earnings	630,712	581,353

HUDSON & MANHATTAN.

	1917.	1916.
July gross	$ 488,701	$ 449,095
Net after taxes	252,316	245,324
Surplus after charges	34,961	31,027
Seven months gross	3,623,013	3,410,310
Net after taxes	1,931,541	1,916,131
Surplus after charges	411,040	410,797

MASSACHUSETTS LIGHTING COMPANIES.

	1917.	1916.
July gross sales	$ 115,526	$ 100,993
Twelve months' gross sales	1,397,301	1,226,474

NORTHERN OHIO ELECTRIC CORPORATION.

	1917.
July gross	$ 570,934
Net after taxes	227,716
Surplus after charges	121,601
Balance after preferred dividend	91,601
Twelve months' gross	5,966,312
Net after taxes	2,476,509
Surplus after charges	1,017,150
Balance after preferred dividend	657,150

Note.—The first of the two new 20,000-kilowatt turbo-generators was placed in operation in the early part of July, but due to necessary adjustments it was impossible to begin continuous operation until August 17. With this unit in operation a material saving will be effected in operating costs, officials state.

ARIZONA POWER COMPANY.

Earnings of Arizona Power Company for June and twelve months ended June 30 compare as follows:

	1917.	1916.
June gross	$ 37,052	$ 24,778
Net after tax	20,344	17,491
Surplus after charges	7,103	5,186
Twelve months' gross	397,829	244,893
Net after tax	262,442	172,033
Surplus after charges	108,857	45,184

COLUMBIA GAS & ELECTRIC.

	1917.	1916.
August gross	$ 719,936	$ 584,585
Net after taxes	321,503	267,798
Other income	160,779	51,822
Lease rentals	292,975	284,552
Surp. after charges	129,473	*27,093
Eight months' gross	7,150,015	5,903,686
Net after taxes	3,665,239	3,026,395
Other income	1,292,886	346,061
Lease rentals	2,323,905	2,257,143
Surp. after charges	2,155,672	652,930

*Deficit.

KEYSTONE TELEPHONE.

	1917.	1916.
August gross	$ 132,327	$122,473
Net after taxes	58,707	57,452
Surplus after charges	30,665	30,599
Eight months' gross	1,040,703	963,215
Net after taxes	496,475	476,960
Surplus after charges	167,091	160,494

PORTLAND RAILWAY, LIGHT & POWER COMPANY.

Earnings of Portland Railway, Light & Power Company for July and twelve months ended July 31, 1917, compare as follows:

	1917.	1916.
July gross	$ 511,624	$ 448,219
Net after taxes	232,581	192,963
Surplus after int., etc.	54,995	11,183
12 months gross	5,727,598	5,437,240
Net after taxes	2,633,683	2,367,723
Surplus after int., etc.	464,100	177,832

This surplus is available for renewals, depreciation, financial requirements of the company, and dividends.

CENTRAL & SOUTH AMERICAN TELEPHONE.

Report of the Central & South American Telephone Company for the three months ended Sept. 30, 1917:

	1917.	1916.
Three months' gross	$1,037,500	$ 725,000
Net after taxes	792,500	517,000
Other income	28,000	8,000
Total income	820,500	525,000
Dividend (Oct.)	209,868	143,565
Surplus	$ 610,632	$ 381,435

LAKE SHORE ELECTRIC.

Earnings of the Lake Shore Electric Railway system for July and seven months ended July 31, 1917, compare as follows:

	1917.	1916.
July gross	$ 171,234	$ 164,595
Net after taxes	64,993	74,302
Surplus after charges	29,873	37,599
Seven months' gross	985,156	886,916
Net after taxes	313,850	312,737
Surplus after charges	72,687	58,221

LEHIGH VALLEY TRANSIT CO.

	1917.	1916.
August gross	$ 279,077	$ 229,704
Net	110,035	102,063
12 months' gross	2,760,031	2,403,604
Net	1,018,209	996,628

UNITED LIGHT & RAILWAY COMPANY.

Earnings for 12 months ended July 31, 1917:

	1917.	1916.
Gross earnings	$1,261,676	$1,254,324
Other income	735,650	584,941
Total income	1,997,327	1,839,265
Net after tax	1,837,831	1,699,601
Balance after interest and B'd disc.	1,190,874	1,140,777
Surplus aft pfd div.	588,792	548,993

Earnings of subsidiary companies of United Light & Railways Company for twelve months ended July 31, 1917:

	1917.	1916.
Gross earnings	$7,177,547	$6,692,615
Net aft tax	2,720,735	2,670,143
Surp aft chgs.	1,278,408	1,272,307

MEXICAN TELEGRAPH.

Report of the Mexican Telegraph Company for the three months ended Sept. 30, 1917, compares as follows:

	1917.	1916.
Three months' gross.	*$ 375,000	*$ 257,500
Net after taxes	270,000	175,500
Other income	43,500	42,000
Total income	313,500	217,500
Mex. Govt's partic.	12,000	8,000
October dividend	124,877	89,735
Surplus	$ 176,623	$ 119,765

*Partly estimated.

PACIFIC GAS & ELECTRIC CO.

	1917.	1916.
August gross	*$1,662,202	$1,494,401
Net after taxes	562,033	560,924
Surplus after charges.	205,265	222,724
12 months' gross	*19,922,094	19,080,989
Net after taxes	8,081,459	8,325,184
Surplus after charges.	3,922,505	4,256,166
Balance after pfd. div.	2,477,181	3,065,825

*Includes sums involved in rate litigation: 1917, $24,494; August, 1916, $24,532; twelve months, 1917, $335,826; twelve months, 1916, $368,112.

STANDARD GAS & ELECTRIC.

Gross and net earnings of the Western States Gas & Electric Co., a subsidiary of Standard Gas & Electric Co., for August, and twelve months ended Aug. 31, 1917, compare as follows:

	1917.	1916.
August gross	$ 116,849	$ 97,515
Net after taxes	55,428	47,084
12 months' gross	1,340,331	1,218,887
Net after taxes	630,712	581,353

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Sept.18.	Bid Sept.25.
Adirondack Electric Fower of Glens Falls, common	..	16	16
Adirondack Electric Power of Glens Falls, preferred	6	68	68
American Gas & Electric of New York, common	10+extra	111	111
American Gas & Electric of New York, preferred	6	45	45
American Light & Traction of New York, common	..	266	260
American Light & Traction of New York, preferred	6	103	103
American Power & Light of New York, common	4	60	60
American Power & Light of New York, preferred	6	82	82
American Public Utilities of Grand Rapids, common	..	28	28
American Public Utilities of Grand Rapids, preferred	6	62	62
American Telephone & Telegraph of New York	..	116¼	118¾
American Water Works & Elec. of New York, common	..	5¾	5½
American Water Works & Elec. of New York, particip.	..	15	12
American Water Works & Elec. of New York, first preferred	..	64	65
Appalachian Power of Bluefield, common	..	2½	2½
Appalachian Power of Bluefield, preferred	7	24	24
Cities Service of New York, common	+extra	234	234
Cities Service of New York, preferred	6	82	81½
Commonwealth Edison of Chicago	8	116½	117
Comm. Power, Railway & Light of Jackson, common	4	47	45
Comm. Power, Railway & Light of Jackson, preferred	6	74	74
Federal Light & Traction of New York, common	..	10	10
Federal Light & Traction of New York, preferred	..	45	45
Illinois Northern Utilities of Dixon	6	77	77
Middle West Utilities of Chicago, common	2+2 extra	39	39
Middle West Utilities of Chicago, preferred	6	66½	67
Northern States Power of Chicago, common	7	80	77½
Northern States Power of Chicago, preferred	7	96	95
Pacific Gas & Electric of San Francisco, common	5	47	46¾
Pacific Gas & Electric of San Francisco, preferred	6	85	85
Public Service of Northern Illinois, Chicago, common	7	86	86½
Public Service of Northern Illinois, Chicago, preferred	6	95	94
Republic Railway & Light of Youngstown, common	4	31	30
Republic Railway & Light of Youngstown, preferred	6	63	64
Standard Gas & Electric of Chicago, common	..	7½	7½
Standard Gas & Electric of Chicago, preferred	6	31½	31½
Tennessee Railway, Light & Power of Chattanooga, common	..	4	4
Tennessee Railway, Light & Power of Chattanooga, preferred	6	24	26
United Light & Railways of Grand Rapids, common	4	35	35½
United Light & Railways of Grand Rapids, preferred	6	67	67
Western Power of San Francisco, common	..	11	10
Western Power of San Francisco, preferred	6	52	50
Western Union Telegraph of New York	extra	89½	88⅝
Industrials—			
Electric Storage of Philadelphia, common	4	56	56½
General Electric of Schenectady	8	139	145¾
National Carbon of Cleveland, common	8	70	*72
National Carbon of Cleveland, preferred	..	*130⅜	130⅜
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	44½	47
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	60	63

*Last sale.